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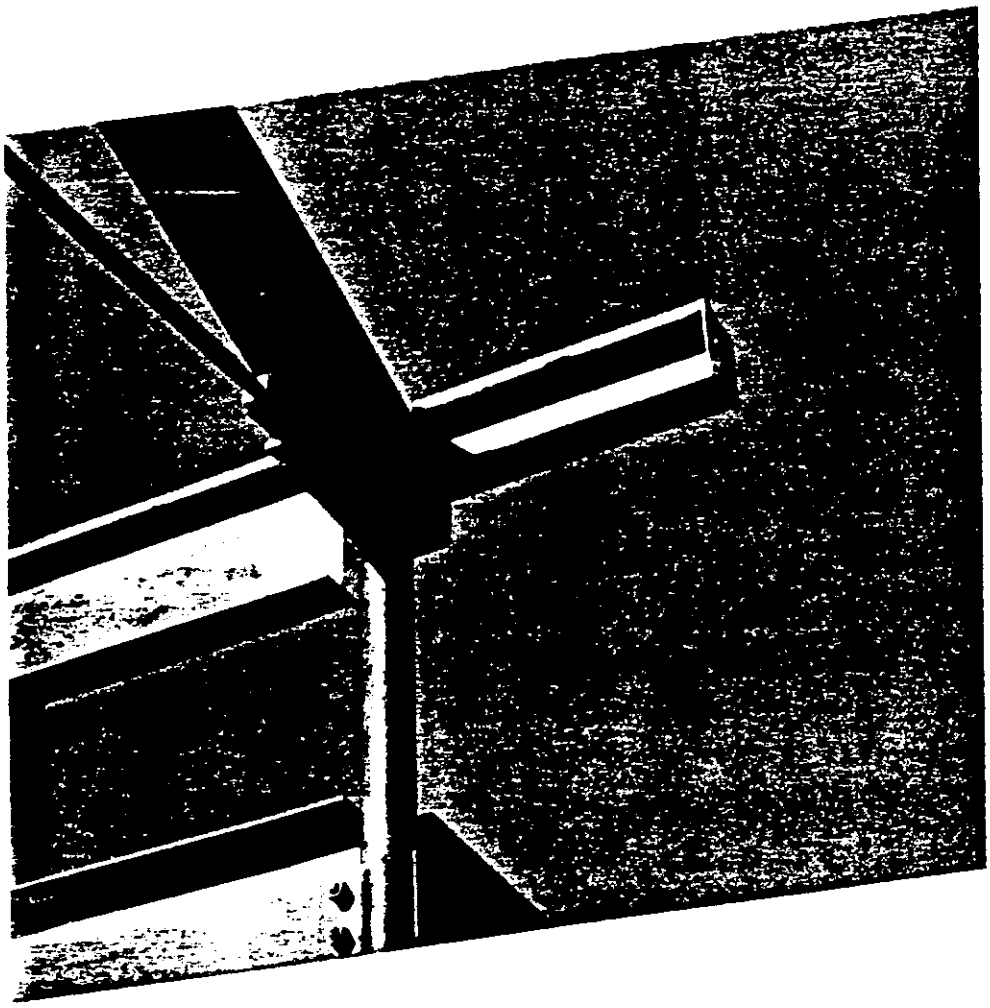
Force Account Pilot Project



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FORCE ACCOUNT PILOT PROJECT

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TABLE OF CONTENTS

I. INTRODUCTION

The purpose of this project is to develop a methodology for gathering and evaluating data on force account expenditures, to attempt a comparison of force account work with contract construction, and to make determinations concerning the adequacy of current accounting and reporting procedures to reflect cost and volume of force account work.

Before continuing, it might be beneficial to define exactly what is meant by the term force account. Force account work is defined in in three different ways:

a. Funded projects performed by local government agencies on an actual cost or unit cost basis.

b. Extra work found necessary after the award of a contract and which must be performed by the contractor in order to complete the project as designed.

c. Contracts to be performed solely on the basis of equipment hours used, including the operators plus material.[1]

Within this study, the term force account is defined as "a", funded projects performed by local government agencies on an actual cost or unit cost basis.

The Building Construction Industry Advisory Committee, (BCIAC), aurhorized this project as a pilot study, for they were aware of the varying degrees of sophistication of accounting and reporting procedures between the myriad of public agencies within the 67 different counties in the State of Florida. They were interested in finding out what problems might be encountered in developing the data necessary to protect the public interest.

PLAN FOR GATHERING AND EVALUATING DATA ON FORCE ACCOUNT EXPENDITURES

To aid in the formulation of the report, State Departments of Transportation, State Highway Departments, and national business associations were contacted to determine what studies had been prepared

which examine the force account versus contract work issue. This study draws from these previous studies to obtain a perspective on what has already been done with this issue.

To minimize travel and data-gathering costs a single governmental unit was selected as the subject of this report. The government body in which there was apparent force account construction, which was chosen, was the Putnam County Public Works Department. Putnam County was chosen because it was known that the county had its own asphalt plant and it was, therefore, believed that the County was engaged in force account work. The County also had a special dispensation. After the study was underway, however, it was determined that the County had drastically reduced the amount of force account work done.

The Public Works Department's most recent past budgets were collected and examined for records of force account expenditures. Interviews were conducted within the departments and governmental subdivisions which were involved in force account work to become familiar with accounting procedures.

An attempt was made to obtain an actual project and audit the public records in an effort to match total expenditures with quantifiable construction work. If this was possible, then the units included in total expenditures in the public accounts would be matched with the items of cost in the private sector for unit price comparisons. If it was not possible to make this comparison, then recommendations would be made on how unit price or productivity could be determined for public force account projects.

FINDINGS TO BE INCLUDED IN FINAL REPORT

It was decided that following the interviews, research, and

Endnotes

1. Correspondence received from the Utah Department of Transportation.

analysis, a report would be formulated which would include the following:

1. Current force account expenditures for the governmental body.
2. Trends in force account expenditures.
3. Public project productivity (if decipherable); or recommendations for changes in accounting and reporting procedures (if necessary) to facilitate more accurate and valid comparisons.
4. A step-by-step methodology for determining the above, including budget accounts in which to look for force account work.

II. STEP-BY-STEP ACCOUNT OF THE METHODOLOGY EMPLOYED IN ATTEMPTING TO OBTAIN INFORMATION

This section provides a detailed step-by step account of the methodology followed in obtaining information on force account expenditures and in examining public project productivity.

Below is a listing of the steps followed:

1. SURVEY OF THE LITERATURE
2. GENERAL GROUNDWORK/CONTACTING THE PUTNAM COUNTY PUBLIC WORKS DEPARTMENT
3. DETERMINING TRENDS IN FORCE ACCOUNT EXPENDITURES/CONTACTING THE PUTNAM COUNTY FINANCE DEPARTMENT
4. ATTEMPTING TO INCORPORATE PHYSICAL UNITS/CONTACTING THE BOOKKEEPER OF THE PUTNAM COUNTY PUBLIC WORKS DEPARTMENT
5. CONTACTING THE DATA PROCESSING DEPARTMENT OF PUTNAM COUNTY
6. CONTACTING THE TRANSPORTATION DEPARTMENT OF TRAVIS COUNTY, TEXAS
7. INTERVIEW WITH MR. BARRY M. HARRISS, DIRECTOR OF THE PUTNAM COUNTY PUBLIC WORKS DEPARTMENT
8. CONDUCTING DAY-ON-THE-JOB STUDY
9. SENDING QUESTIONNAIRES TO ASPHALT PAVING COMPANIES IN PALATKA

STEP 1 - SURVEY OF THE LITERATURE

As indicated earlier, State Departments of Transportation; State Highway Departments; and national business associations were contacted to determine what studies had been prepared which examine the force account versus contract work issue. It was found that there are two distinct categories of information: 1) Writings on the force account issue and 2) actual state cost accounting and recording frameworks. Information which is included in the first category will be considered now, while that which is included in the second category will be included in the third section of the report.

Studies and information which were particularly helpful in examining the force account issue include Franzke's, A Study of the Construct by Contract Issue, December 1978, (underwritten by the Associated General Contractors); a report entitled, Construction by Contract, compiled and prepared by Construction by Contract Committee, New Jersey Alliance for Action; Analysis of Maintenance Costing with Emphasis on Contracting Versus Using State Forces, by G.R. Allen and F.N. Lisle, Research Scientists at the Virginia Highway and Transportation Research Council; Robert A. Meyer's, "Cost Analysis in Public Works Decision-Making," Public Works, March 1983; a newsletter on the "Private Supply of Public Services," circulated by the Institute for Private Sector Public Services, in Grants Pass, Oregon; an article published by the National Construction Industry Council located in Washington, D.C.; communication and publications received from the Construction Industry Force Account Council, and a videotape entitled, "Lazy DOT Crew", from WJXT Television Station in Jacksonville. These studies, reports, manuals, etc., were quite helpful in the examination of the force account versus contract work issue, and provided insight into the establishment of various organizations and institutes to examine this issue.

In Franzke's, A Study of the Construct by Contract Issue, it is indicated that the comparison of current construction costs between the public and private sectors is a difficult task due to the differing accounting and reporting systems, and incentives which drive the two parties. To complicate the matter, the issue of which party can perform public work at least cost is often viewed from a political perspective,

rather than from the taxpayer's point of view.[1]

There are the private contractors, "interested in expanding their market and resentful of competition from tax subsidized public construction 'companies,'" and the public agencies, "particularly public works and engineering departments, which resist shrinkage of the scope or volume of their activities which they interpret as diminishing their 'importance'." Thus, rather than considering what is in the best interest of the taxpayer, or the "analytical" aspects of the issue, the debate often becomes "adversarial."[2]

Consider the following arguments "for" and "against" contracting to private contractors and notice the difficulty that one encounters in attempting to place a value on each.

Arguments "For" Contracting to Private Contractors

The following is a listing of arguments frequently cited "for" contracting to private contractors:

1. The public pays for what it receives; work actually performed is the basis of payment.
2. The price is fixed and the public has no risk of cost increases.
3. Timely completion is assured by the liquidated damage provision.
4. Faithful performance is backed by a 100 percent bond.
5. Part of the contractor's earnings are retained until acceptance, as added assurance of performance.
6. Risk of damage during construction is borne by the contractor, not the public.
7. The contractor must "defend and hold harmless" the public against claims and must provide the public with insurance coverage.
8. Quality inspection is "at arm's length" by independent inspectors.
9. The final work is warranted and defects must be corrected at no expense to the public.[3]

10. Work loads can be varied in response to needs rather than to manpower at hand.

11. Work programs can be rapidly altered because equipment purchases are not involved.

12. The private sector provides effective management incentives.

13. The number of an agency's personnel problems is reduced.

14. The need for in-house training for specialized work can be minimized.

15. Contractors tend to continue to improve once they obtain contracts in order to retain the work.

16. One of the most compelling reasons for using a contractor is that he is probably more skilled at performing a specialized activity than public agency forces, who perform the work as an infrequent activity. Furthermore, because of the large volume of work a specialized vendor may have cost advantages that public agencies do not. Some may argue that if expertise is not maintained in-house, one is at the mercy of the contractor; however, market competition and the bid process significantly nullify this potential problem.

17. Regarding quality improvements in the provision of maintenance by contract, the production specialist will undoubtedly have a strong incentive to maintain a competitive position through quality improvements, particularly in the placement and use of materials. The fact that a public agency may have an internal research facility that commits significant effort to maintenance research seriously weakens this argument.

18. Flexibility cannot be overlooked as a strong argument for contracting. It is of particular importance for a highway department because the highway industry undergoes frequent changes in both technology and materials prices. In such situations, a decision to perform an activity in-house may involve extreme costs in the long-run if there is a change in quality requirements, technology, or materials costs.[4]

Arguments "Against" Contracting to Private Contractors

The reasons most often expressed why public agencies must continue in the "construction business" are these:

1. Emergency work.

2. Bidding expenses.

3. Insufficient contractor interest.

4. Employee layoffs.

5. Local control.

6. Lower cost.[5]

7. Reduced engineering costs.

   Preliminary engineering costs are reduced considerably since detailed plans and specifications are not necessary. Construction engineering is also substantially reduced since only review inspections are required. The public agency's foreman directly controls all day-by-day operations.

8. Reduced need for development and compliance with special provisions.

   It is often difficult and time-consuming to write unique specifications for rehabilitation work, particularly when structures are involved. Changes in the scope and extent of the necessary work can be handled expeditiously during construction when being built by force account methods.

9. Time from inception to completion.

   Many times the type of project done using force account methods is small and immediate in nature. Reduced survey, preliminary engineering, development of specifications, approvals and the absence of the need to develop and administer a contract significantly decreases the time from inception to the completion of a project.

10. Use of local resources.

    A substantial portion of the labor, equipment, and materials needed for a force account project is purchased from individuals and small contractors working and living in the area of the project.

11. Expertise within the governmental unit.

    Force account construction activity allows the public agency to maintain within its work force the skills and personnel necessary to be able to do construction work. This capability is important to the public agency in order to provide cost comparisons to contract work and to have their personnel with the knowledge able to properly review construction by others.

(The Maine Department of Transportation has reported that force account construction of small relatively uncomplicated projects saves money.)[6]

12. Contracts increase paperwork.

13. Incomplete or faulty work by contractors may increase costs.

14. When construction work is "contracted out" direct control of work by the public agency is lost.

15. Scheduling problems with contractors may arise.

16. Contractors may not be sufficiently sensitive to agency and policy objectives.

17. Contractors may not be sufficiently responsive to changing or unique conditions.[7]

Difficulties Encountered in Comparing Public and Private Sectors

As indicated earlier, comparing current accounting and reporting procedures between the public and private sectors is a difficult task due to the distortions in how costs are recorded.

For example, with respect to profits and taxes, the public sector is not expected to show a "profit" as Franzke indicates in A Study of the Construct by Contract Issue, and the public sector does not pay many of the taxes paid by the private sector. The following is a listing of taxes that may be paid by the contractor:

Payroll Taxes -
- F.I.C.A.
- State Unemployment
- Federal Unemployment

Equipment Taxes -
- Property Tax
- Federal Diesel Tax
- Federal Use Tax
- State Truck License

Miscellaneous Taxes -
- State excise tax on income.
- Federal income tax.
- Stamp tax on bond.
- City and county income tax.
- City license tax.

(The public agency does pay F.I.C.A. and State Unemployment.)

Thus, the private sector returns money, paid in the form of taxes, to the economy. Also, the private sector normally pays higher wages and earns a profit which will eventually be returned to the economy.

Franzke examines the distortions which arise when comparing costs by considering four separate elements of cost in turn. This is done in order to obtain a more accurate depiction of the difficulties which exist. These elements include wages, materials, equipment costs, and administrative costs.

With respect to wages, there are several distortions which may exist. First, wages paid to public employees involved in construction may be much lower than the rates which state law requires to be paid to private employees.

"The effect of the present law is to create an inherent disadvantage to the private sector in any comparison of public and private construction costs."

Secondly, hours of work per day introduces a difficulty with respect to wage comparisons. That is, private sector employees go directly to and leave directly from the project site. Public sector employees, on the other hand, generally report into the Public Works Headquarters both before and after their shift. Although employees of both sectors begin and end their workday at the same time the public sector employees may be at the project site substantially less than eight hours. (This will be seen later in a "Day-on-the-job" study that was conducted.)

Thirdly, the cost recording of fringe benefits paid to or on behalf of workers creates additional distortions. For instance, Franzke indicates "in some jurisdictions,..., retirement benefits are a

Cost Analysis

Having noted the the frequently cited arguments "for" and "against" contracting to private contractors, and the distortions in how costs are recorded, the attention turned to cost analysis; how cost information may be calculated, cost recording systems, and cost-accounting and control systems.

Robert A. Meyer in his "Cost Analysis in Public Works Decision-Making," (Public Works, March 1983), indicates that, "raw cost data (labor, equipment, and materials used in a particular activity) can be obtained in several ways. One method is to have each foreman carefully account for each of these categories and the actual progress made on a daily basis. This can usually be noted quite easily on the same form that contains daily payroll information."

"Another method is to have a general foreman note this same information in a diary or daily work record based on his regular contact with the operation."

"In either case, efforts should be made to ensure that the information obtained is accurate since the result of the cost calculations will be only as accurate as the raw data used."

In order to illustrate how cost information may be calculated, Meyer considers an example, with the first step involving a compilation of the raw data on one form. The job is defined, for instance, as Gravel Operation as in Meyer's example. The date is recorded, along with the employee's name, labor class, the number of hours worked, type of equipment used with corresponding number of hours, and cubic yards of materials used and quantity produced.

The second step in Meyer's example calculations involves the

calculation of fringe benefits. The employee's name is recorded with the corresponding number of leave days, including vacation days, sick days, holidays, personal days. This is divided by the total number of working days, 260, (5 X 52), to obtain the percentage of leave days taken. Also, the current year cost of hospital insurance divided by the department payroll is reported along with the social security rate, and retirement rate (current year). From this information, a total rate is obtained; this rate being the labor burden. (In an interview with Mr. Barry M. Harriss, the results of which occur later on in the study, it was reported that 35% of direct labor costs are added for retirement, vacation time, FICA, fringe benefits, etc.)

Meyer's third step involves the calculation of total labor costs, including fringe benefits. The payroll period and job description are recorded. Under this heading, the employee's name, labor class, base hours, premium hours, base wage rate, total wages, percentage of fringe benefits, total fringe benefits, and the sum of wages and fringe benefits are recorded. With this information, the total labor cost is calculated.

With respect to equipment costs, the type of equipment used, dates used, hours, total hours, hourly rate, and total cost are recorded to obtain the total equipment cost.

Meyer indicates that, "equipment rates also require careful attention. The actual cost of operating a piece of equipment on an hourly basis is not only the cost of the fuel and lubrication but also the initial cost of the equipment (including overhead and depreciation); overhaul costs; repairs; and replacement of expendable items such as tracks, blades, and tires. All of the latter are amortized over the

useful life of the equipment. These rates may be obtained specifically from maintenance records on each individual piece of equipment... Again, some judgment must be used in applying these rates to a particular piece of equipment to assure that they are reasonable." (The need for this calculation within public agencies must be emphasized. The Putnam County Public Works Department, itself, is just now developing a valid plan for replacement, as will be seen later on in the study.

With respect to material costs, the date, quantity used, unit cost, and total cost are recorded to obtain total material costs. According to Meyer, "material costs are simply the cost of all materials used on the job as delivered to the jobsite."

With the preceeding information, one may calculate total job costs as the sum of labor, equipment, and material costs. This figure is divided by the total level of production, which may be in cubic yards, as in the gravel operation example, to obtain the unit cost per cubic yard.

"This value may be used several ways. First of all, this unit cost may be used to decide if it is cheaper to manufacture gravel (or make asphalt) in-house or buy it directly from a supplier... Delivery costs may play an important part in this decision."

"The resulting unit rate may also be used as a comparison of variables in the operation itself. For example, a larger piece of equipment or additional men may speed production but at the cost of increased hourly rates. Does the added productivity justify the increased cost? A comparison of the resulting rates will tell."

"These unit rates may also be used in estimating the cost of providing a known quantity of gravel and the time and resources

necessary to do so." (See Appendix II-A for Meyer's article in its entirety.)

It was decided that in contacts with the Putnam County Public Works Department the attempt would be made to determine how closely aligned the Department was with a cost analysis framework such as that outlined by Meyer, and what recommendations could be made in the development of a more accurate cost-accounting and control system.

Emphasis on Contracting-Out

It was noted that a number of studies and publications received, emphasize the benefits of contracting-out.

For example, the State of Virginia has prepared a study where it is indicated that some states such as Arizona and Iowa, have received orders from their legislatures to investigate the possibility of "contracting out" for maintenance work as an alternative to doing the work in-house. This concern has surfaced due to the serious budget constraint that many state highway agencies are facing. "The budget constraint is really twofold. First, revenues are either declining in the nominal sense or are not increasing rapidly enough to offset inflation, and, second, as highway systems get older, maintenance expenditures become an increasing share of the budget. With such pressures, highway administrators and legislators are looking for ways to either cut costs or operate more efficiently. One avenue being pursued is the potential for contracting certain maintenance functions."[8]

There also exist publications such as a newsletter on the "Private Supply of Public Services" which is circulated by the Institute for Private Sector Public Services, and which is located in Grants Pass,

Oregon. In the July/August 1982 issue, there is a segment which refers to a city of 22,000 in Lafayette, California, which in July, 1977 began contracting with Roy Jorgensen and Associates, Inc., "engineering and management functions." Since this new development, the city of Lafayette has witnessed "significant cost savings."

At the federal level the emphasis is on contracting out, as well. In an article entitled, "Contracting Out - A Mandate for Efficiency and Economy in Public Construction," written by the National Construction Industry Council located in Washington, D.C., it is indicated that, "since 1955, the government's policy has been to rely on contractors in the private sector to provide the goods and services it needs to act on the public's behalf."

> The cornerstone of this policy of reliance on free enterprise is Office of Management and Budget (OMB) Circular A-76, 'Policies for Acquiring Commercial and Industrial Products and Services Needed by the Government.' This policy 1) reaffirms the government's general policy of reliance on the private sector for goods and services, while recognizing that 2) certain functions are inherently governmental in nature and must be performed by governmental personnel, and 3) relative cost must be given appropriate consideration in decisions between in-house performance and reliance on private commercial sources.
>
> Under the Circular agencies are required to inventory their in-house commercial and industrial activities and establish schedules for periodic review. When appropriate, cost comparisons must be conducted of these activities to determine the most economical source of performance - contracted out or in-house.

The Construction Industry Force Account Council, (CIFAC), which is a statewide (California) labor-management coalition, has prepared a Force Account Manual - "A Definition of Force Account and an Outline of Steps to Bring it Under Control." Another organization within the State

of California which is involved with the force account issue is the Construction Industry Research Board which is supported by grants from the Construction Industry Advancement Fund of Southern California, the Fund for Construction Industry Advancement, and the California Construction Advancement Program. The Construction Industry Research Board has prepared a "Supplement to CIFAC Force Account Manual" for the Construction Industry Force Account Council which incorporates force account limits and competitive bidding requirements in city charters and state laws.

A videotape entitled, "Lazy DOT Crew", which was shown on the WJXT, (Jacksonville), evening news on April 1, 1983 was received. The audio portion of the tape is as follows:

It took a six man Department of Transportation crew six hours Thursday to replace this eight foot section of curb...What they did't know was they were working outside our office windows...

This is how the crew spent most of their day...Although we didn't begin taking pictures until 1:45...

Little had changed by 2:15.

By 2:45 it was time for a water break and a wave to passerbys.

At 3:15 the discussion moved to the rear of the truck...

And at 3:30, it was time to call it a day.

Out of curiousty, we called a private contractor...His estimate for the same job...Two men, three hours, a hundred and fifty dollars. The state's cost was at least 300 dollars. We also took our video tape to the Director of DOT Maintenance.

The problem is not isolated...The DOT receives regular complaints from all over the state...It is one reason why the state hired a new

maintenance engineer six months ago.

SOT: W.M. Hilliard

State MTC Director.

Those procedures include increased contracting with private enterprise...Sending crews to repair known potholes instead of sending them out to look for problems...And a hiring freeze so fewer people do more work.

SOT: Hilliard

The state spent twice what this job should have cost...There is no estimate on how much money is wasted on similar jobs.

STEP 2 - GENERAL GROUNDWORK/CONTACTING THE PUTNAM COUNTY PUBLIC WORKS DEPARTMENT

As it was one of the intents of our Force Account Pilot Project to examine public project productivity and to develop a methodology for doing so, the Public Works Department in East Palatka was contacted to ascertain whether it was possible to obtain a listing of itemized expenses, with respect to road construction work performed by governmental employees, which could then be compared to contract construction.

The Department indication was that contract construction information was fed into their computer, and that the Department was in the process of putting in-house construction work information on their computer, as well. It was indicated that in-house construction expenses had been recorded by an individual within the Road Department. An initial interview was conducted with this individual in an attempt to gain some insight into the cost recording and accounting system of the Public Works Department and so that appropriate directions for research could be ascertained.

In the course of the interview, it was discovered that in the past, reports related to labor, materials, and equipment were kept that were not thorough. (one element lacking was usable physical units.) With respect to equipment, if gas is required, the amount of gas is recorded. The type of work is recorded, as well as location, along with road name and the corresponding number of hours. For materials, number of loads and "to" and "from" are recorded. Notice that road mileage is not posted, nor is quantity of materials used, or what laborers physically do. (See Appendix II-B for reporting forms

used by the Putnam County Public Works Department.) There also existed a backlog of in-house construction work data (from 1981) which had not yet been recorded.

In the course of the interview it was determined that the asphalt plant which until recently had been operated by the Public Works Department was almost worn out. A number of pieces of equipment were worn out, as well. (Some pieces were purchased in the 1950's.)

With respect to cost recording, equipment rates and material price data sheets are referred to. The recording system is rather outdated, as it was stated that the same equipment price list had been used from 1974 until 1/82. Also, in 1974 the asphalt price was $4.90/ton and was only recently increased to $30.00/ton.

Their cost recording on sheets such as found on Cove Road, (see Appendix II-B), for equipment use are only as accurate as the price found on their equipment sheet is to actual cost. Their material prices for in-house produced materials, (asphalt), is only as accurate as their material price list is to actual cost. Only invoiced materials and rented equipment costs are truly accurate.

The Director of the Public Works Department, Mr. Barry M. Harriss, was encountered briefly at which time he indicated that the Department recently decided to terminate most force account work on new construction. The Director felt that if they were going to build roads, then road construction was to be first priority, making other public works functions secondary. This was not decided on as the goal of the Putnam County Public Works Department. In other words, there should be devotion to construction work only, or it should be "contracted out." Their own employees primarily do patching work now.

STEP 3 - DETERMINING TRENDS IN FORCE ACCOUNT EXPENDITURES/CONTACTING THE PUTNAM COUNTY FINANCE DEPARTMENT

It was the intent of this project to not only examine public project productivity and to develop a methodology for doing so, but to obtain information about, "current force account expenditures for the governmental body" and "trends in force account expenditures." In this regard, the Putnam County Finance Department was contacted. It was determined that in the Putnam County Board of Commissioners Appropriation and Expenditure Report, there exists the Road and Bridge Fund, which includes sections for Engineering and Roads and Bridges, the Transportation Trust Fund, which includes expenditures from the 5th and 6th Cent Gas Tax, and the Federal Revenue Sharing Trust Fund, which may include a section for Roads and Bridges. It was indicated by a Finance Officer of Putnam County that approximately 80% of the expenditures from the Engineering Sections and 90% of the expenditures from the Roads and Bridges Sections of both the Road and Bridge Fund and the Federal Revenue Sharing Trust Fund are for work done in-house. Almost 100% of the expenditures from the Transportation Trust Fund are utilized for the purpose of contracting out road construction work.

The "line items" in the Engineering section of the Road and Bridge Fund include; Regular Salaries and Wages; Social Security Matching; Retirement Contributions; Life and Health Insurance; Contract Services; Travel and Per Diem; Transportation; Rentals and Leases; Repair and Maintenance Service; Printing and Binding; Other Current Charges and Obligations; Office Supplies; Operating Supplies; Books, Publications, Subscriptions, and Memberships; and Machinery and Equipment.

The "line items" in the Roads and Bridges section include;

Superintendant Salary; Regular Salaries and Wages; Social Security Matching; Retirement Contributions; Life and Health Insurance; Professional Services; Other Contractual Services; Travel and Per Diem; Communications; Transportation; Utility Services; Rentals and Leases; Repair and Maintenance Service; Other Current Charges and Obligations; Office Supplies; Operating Supplies; Road Materials and Supplies; Books, Publications, Subscriptions, and Memberships; Buildings; Machinery and Equipment.

The approximate levels of in-house expenditures for the period 9/30/77 through 9/30/82 are as follows:

9/30/77 - $1,335,281.41

9/30/78 - $1,592,960.19

9/30/79 - $1,540,693.84

9/30/80 - $1,740,360.87

9/30/81 - $1,866,427.76

9/30/82 - $2,060,210.37

(See Appendix II-C for Appropriation and Expenditure Reports and a bar graph which displays expenditure levels for work done in-house, work contracted out, and total expenditure levels, for the years 1977 through 1982.)

STEP 4 - ATTEMPTING TO INCORPORATE PHYSICAL UNITS/CONTACTING THE BOOKKEEPER OF THE PUTNAM COUNTY PUBLIC WORKS DEPARTMENT

After having obtained the Expenditure Reports from the Finance Department, the Public Works Department was contacted again to determine if any comprehensive reports were kept with respect to physical units; e.g., how many miles of highway and bridges were constructed, how many ditches dug, how many tons of asphalt used, what laborers actually

physically do, etc. It was hoped that the reports which incorporated the physical aspects could somehow be coordinated with the "expenditure side." It would then be possible to compare this information with itemized expenses associated with contract construction and then some judgement be made with respect to public project productivity.

The indication from the bookkeeper was that the Public Works Department does not have the type of detailed report that was needed. They said they were, however, in the process of putting their data into a computer system. This led to inquiries concerning the forthcoming change to computer operation.

STEP 5 - CONTACTING THE DATA PROCESSING DEPARTMENT OF PUTNAM COUNTY

Charlie Noah, of the Data Processing Department of Putnam County, was contacted. He is an integral part of the new system. This system involves putting the road maintenance data into a computer for the Public Works Department.

He indicated that the new computerized system is in the developmental stage. There is a data base for all roads, with detailed descriptions. The new computerized system includes maintenance costs, not costs for road construction. There exists a Master Record and Detail Data.

The Master Record includes items such as county commission district and number, road name, two alternate names, subdivision, commission jurisdiction, date accepted, type of acceptance, data concerning legal status, subdivision number, fire district, length of road, year to date maintenance costs, costs two years ago, benchmark to mark beginning of road, and direction road takes.

Within the computerized system, the Detailed Data includes the

following three items:

1) One record for each benchmark.

2) Surface, width, and curving of road.

3) Maintenance data including what type, what done, cost, beginning and ending mile, total miles of road, what type of material used - sand, clay, etc., cost for each commission district, total number of miles for how many maintained with corresponding cost.

(It was found that the Public Works Department is not trying to develop accurate cost control records through the computer. Nor does there exist appropriate quantitative, physical information relative to maintenance.)

Within the course of the conversation, Charlie Noah indicated that the Public Works Department of Putnam County was modelling their new data processing system with that in Travis County, Texas.

STEP 6 - CONTACTING THE TRANSPORTATION DEPARTMENT OF TRAVIS COUNTY, TEXAS

The Transportation Department of Travis County, Texas was, therefore, contacted and the following information was received: A copy of an article in the Public Works Magazine for May, 1983 written by Tom Spoonts, Transportation Administrator, which outlines their computer system; a copy of their menu screens; and the documentation manual for their Univac 90/80 system use.

The article in the Public Works Magazine, which outlines the Travis County computer system, indicates that initially the "existing record system (much of which was never documented)" was studied with the intent of "putting together a system that was completely documented, accurate, readily accessible, expandable (for maintenance input), and available in some form to various precinct staffs as well as county

engineering personnel."

"Existing records were studied for accuracy and updated. This entailed putting all available recorded information into one master file. Indepth field studies were then started. Every mile of the county road system was driven and the following information logged: number and type of drainage structures, existing official signing, road length, traffic striping (existing and needed), right-of-way width and pavement width, type of roadway base, and type of roadway surface."

"Each road was assigned a distinct six-digit number which identified its location in the county by road atlas sheet number."

"The average daily traffic figure was obtained from state highway department files and put into the master file."

"After analyzing the quantity of information desired to be recorded, it was decided to go with a computer record system. As Travis County already had a computer system at its courthouse complex, the only requirement was the installation of video terminals in the county engineering department and the development of computer programs (software) to process the road records."

"There are four basic information programs used currently in the system": Find Road Number by Name Search, Display General Road Record, Display Maintenance History Record, Display Traffic Record.

Under "Find Road By Name Search... all road information is stored under the unique number for each road. If that road number is not known, it can be found by the use of this program."

Under "Display General Road Record" the following information is displayed on the video terminal:

1) Road number.

2) Road length in miles (to the nearest hundredth).

3) Other names by which the road is referred to.

4) Precinct number where road starts.

5) Tax map number (which is also aerial photograph number).

6) City of Austin grid map number.

7) Sherriff's patrol district number (for locating fire, police, and ambulance emergencies).

8) Description of the beginning and ending locations.

9) Right-of-way widths (three figures: minimum, maximum, and mode).

10) Road condition number (composite number from 1 to 100 for comparison with other roads in the same precinct).

11) Subdivision name (if road is in a subdivision.)

12) Number of bridges.

13) Pavement types, curb types, and surface widths (for up to five mileage segments).

14) Legal status of road.

15) City or village (if road starts there and runs into county).

16) Whether or not road is accepted by county for maintenance and what type of maintenance (for up to five mileage segments).

17) Plat record book and page number for up to four parcels of deed or dedication.

Under "Display Maintenance History Record... up to 100 different maintenance operations can be coded into the record for individual mileage segments of roadway when maintenance work is done. This program displays the last ten records of maintenance work done on the road. A simple coding system describing the type of maintenance was devised to be kept by the precinct offices so that regular updating of maintenance records on the computer would be done easily."

The "Display Traffic Record... program displays up to five traffic counts by date and mileage segment along a road."

(See Appendix II-D for information received by the Transportation Department of Travis County, Texas.)

STEP 7 - INTERVIEW WITH MR. BARRY M. HARRISS, DIRECTOR OF THE PUTNAM COUNTY PUBLIC WORKS DEPARTMENT

Having obtained preliminary information concerning the implementation of the new computerized system at the Putnam County Public Works Department, and procured a thorough account of the forms and reports that were filled out by the Road Department, it was decided that Mr. Barry M. Harriss, Director of the Putnam County Public Works Department, would be interviewed. It was hoped that Mr. Harriss could provide further information with respect to the Public Works Department cost recording and cost accounting system, and the forthcoming movement from manual recording of maintenance data to a computerized system.

When interviewed, Mr. Harriss was questioned about the forthcoming movement from manual recording of maintenance data to a computerized system. The indication was that, presently, they do not have documentation, but rather simply an explanation of what the program will do. The Public Works Department has been working with the computer for one year and they are now beginning to refine their input.

There is, however, no designation of work contracted out versus work done in-house. Presently, the Department is trying to get a handle on information such as, how many roads they have, where they are, how long they are, what surface type they have, what kind of maintenance they require. The plan was to establish a general information data base.

Maintenance data in the past has been recorded manually by the

Road Department. It is Mr. Harriss' intent to refine this system. The information had been kept on record cards as turned in. The type of information recorded comes from Equipment Use Reports, which were referred to earlier. With respect to labor expenses, for instance, the laborer's name and number of hours worked are obtained from these reports and his hourly rate of pay according to his labor classification is looked up in a table. The calculation is done independently from their payroll calculation, which is done from time books turned in bi-weekly by the Supervisors to the bookkeeper, who transmits the information to the Payroll Department, which makes out the paychecks. There is no indication of what the laborer did or how many miles of road were worked on. This type of recording system is very unproductive, however, according to Mr. Harriss, as the county has only a recording system, rather than a cost accounting system.

The Director stated that there exists a uniform accounting system throughout the State of Florida which is broken into functional categories. The indication was that the "line items" are too general and the system is very poor.

The Director indicated that when the new system becomes more sophisticated he would like data to become incorporated into the framework daily so that he would know how much he spent, and, therefore, be able to quote more accurate prices in the future. He would like the computer to do a sorting function related to how much the Department spent on other roads, in order that he could determine how much he accomplished and how much it cost. This could then be used in presentations to the commission.

Mr. Harriss indicated that the first step had been implemented in the new computerized system - namely, an inventory listing of what roads

they have. He would then like to find out which ones are paved, which ones are not, and the length of the latter, for that determines what type of maintenance one needs.

Mr. Harriss stated that roads were initiated into the maintenance system by popular vote of the Commission. When a road is incorporated into the county maintenance system, a resolution is passed along with a legal description. This description, however, does not include, length, width, statement of right-of-way zones of the county, nor how wide the road is. This is the type of information, though, that Mr. Harriss would like to have access to.

It was indicated that since he went to work for the Public Works Department two years ago, the system that had been entrenched has been changed.

In "the regime" preceeding Mr. Harriss, the Public Works Department owned and operated its own asphalt plant and did both new road construction work and maintenance work.

The decision to shut it down was made by both Mr. Harriss and the Commission, because of demands placed on the Road Department to do "odd jobs" in addition to new road construction work; very often the Road Department was diverted from its "main mission" of building roads. When resources were pulled away from the building of new roads a number of people would become dissatisfied and the Public Works Department was apt to get a reputation for doing slow work.

Mr. Harriss, in conjunction with the Commission made a conscious decision to stop building roads with public employees. He indicated that any new roads that needed to be paved should be done with an outside contractor.

(The asphalt plant was recently offered for sale at auction. The high bid on it was $3,000, which is scrap metal value. The Board and Mr. Harriss declined to sell at that price. There have been several ideas advanced about the possibility of leasing the plant to a private individual or firm; and for that entity to make asphalt and sell it to the county.)

He was also able to get the commission to agree to "contract out" for engineering services. The company that was selected was put on retainer to avoid the repetitive bidding and selection process.

Since the movement to "contracting out" for services, Mr. Harriss has noticed a marked improvement in his own men's work, with part of the improvement being due to a reduced dependence on both the weather, (new road construction work is very weather-dependent), and utilization of the Department's own equipment. Mr. Harriss is now doing considerable thinking about contracting outside for garbage waste collection services.

Mr. Harriss indicated that much of their equipment was "worn out," and that there did not exist a replacement procedure. That is, there was no financial planning system for county equipment. Thus, equipment was bought and utilized until it was worn out, and then an often futile attempt would be made to justify an increase in the allocation of funds to the Public Works Department to replace the equipment.

With respect to equipment costs, Mr. Harriss has an informal rule that with lease purchased equipment over $10,000, three percent of the purchase price is calculated over 48 months in order that the budget is not depleted.

When questioned about whether he has any departmental cost reports

incorporating physical units with unit prices, for use in making engineering or project estimates in the planning stage, Mr. Harriss indicated that he consults the Nielson Data Quest Blue Book for equipment costs. He has a subscription for a year and may obtain an updated version every five years. He feels that he does not need to refine the data any better. An effort is being made to incorporate that data into what the Road Department is doing and including it in the computer system for estimating purposes. At the present time, they are attempting to enable the computer to accept the data. The data collection process will ensue.

The indication was that they are just now developing the data base of the computerized roadway maintenance system, and have not yet reached the point where that system incorporates cost.

One difficulty encountered by the Public Works Department is the non-existence of a valid cost accounting system. Thus, the Department does not have cost information beyond "normal maintenance", unless the work is "contracted out."

Mr. Harriss indicated that the difficulty is not with collecting the data but rather where to put it. He also stated that there does not exist a "breakdown" of the data necessary to make cost comparisons.

According to Mr. Harriss, if an effective cost accounting system were in place, there would be a place to put the data he has access to.

The Director was asked if in a quote for a road the "labor burden" is incorporated, as in the contractor's quotation. Mr. Harriss' response was that he estimates direct labor and adds 35% for retirement, vacation time, FICA, fringe benefits, etc. With respect to material costs, he adds 10% for handling, getting the materials to the jobsite, moving them around once they are there, supervision, etc. The Blue

Book, as indicated, is consulted in determining equipment costs.

The Putnam County Public Works Department has a special dispensation to do construction projects larger than $50,000 with their own forces, about which we inquired. Mr. Harriss indicated that there is a statute which specifies that any roadwork over $50,000 published by counties should be contracted in a competitive setting. A former Putnam County property appraiser went to see the then Governor Rueben Askew to see if it would be possible to have the county exempt from this statute and build its own roads. The appraiser indicated that the county has its own asphalt plant with capable people to operate it, is not located near any population centers, and cannot, therefore, attract the "big city" contractors to build their roads for any price within reason. A special bill was, therefore, passed which allowed the county to build its own roads. (As indicated earlier, the Public Works Department is currently minimally involved in new road construction business due to dissatisfaction with progress and productivity.)

STEP 8 - DAY-ON-THE-JOB STUDY

On July 12, 1983, Michele La Morte and G. Arlan Toy appeared before the Putnam County Board of Commissioners. The request was made to view the Putnam County Public Works Department crew at work for a day. Permission was granted by the Board.

A "day-on-the-job" study was conducted in an effort to gain first-hand knowledge of the working patterns of a Putnam County Public Works Department crew. It was also hoped that all records, including daily time book, equipment use reports, labor cost reports, etc., from the beginning of the bridge job could be collected to determine the effectiveness of the Department's recording system, and to be able to

compare in-house unit prices with typical unit prices used by a contractor.

The Public Works Department crew was observed working on the Bannerville Road Bridge, Project #830535, located in Putnam County, (four miles west of Palatka, six miles north from that point, and three miles out Bannerville Road), on July 21, 1983.

The bridge is a treated pole structure with treated 8 x 8 pile caps, 4 x 12 stringers, 3 x 8 decking, with deck runners and handrails. There are four support sets of four piles per support.

When viewed at 7:30 a.m. on July 21, 1983, the project had the four support sets each with a pile cap across it and the retaining piles for wing walls driven at either end. The excavation was not complete and there was a temporary filled road on the north side of the structure.

Before the crew arrived, the following photographs were taken of the jobsite:

1. East End
2. Center Two Supports
3. West End
4. Southwest Corner
5. Northwest Corner
6. Top East End
7. Temporary Culvert at West End

When work was completed for the day, photographs were taken from the same locations to note progress levels.

(See Appendix II-E for photographs.)

The crane operator arrived at the jobsite at 7:45 a.m. in a Putnam

County Road Department Little Giant, Number 48, with a ½ yard bucket in dragline set-up.

At 8:30 a.m. the men had not arrived yet. The crane was still sitting in the same position with the operator waiting for the crew from the Public Works Department.

Three members of the crew arrived at 8:39 a.m. At 8:42 a.m. a Ford pick-up truck, Number 49, arrived with the remaining two crew members.

At 8:47 a.m., the crane moved into position and everyone prepared to begin work.

Jim Taylor, the Supervisor, said they would be aligning the piles and attaching the pile caps.

At 9:35 a.m., the crew was setting up to straighten the southmost pile on support number two, or the west center support. (See Appendix II-E for photograph #8.)

The crew then continued to spike the pile cap to piles. (See Appendix II-E for photograph #9.)

At 9:47 a.m., the crew was setting up to straighten second to southmost pile on support number three.

The crew then began spiking pile cap to third pile.

At 10:07 a.m., the crew was setting up to straighten second to northmost pile on support number four. (See Appendix II-E for photograph #10.)

(The crane was used throughout to pull and align the piles underneath.)

The crew then began spiking the pile cap to fourth pile, worked with the layout, and did some stringlining for the stringers.

At 10:20 a.m., the crew took a break which lasted until 10:35 a.m.

At 10:37 a.m. the Dragline began operating with the bucket pulling back the dirt on the north side of the bridge and the south side of the temporary roadway. (See Appendix II-E for photograph #11.) This was done at this time because access was going to be closed off by placing of the stringers. The rest of the crew began placing stringers.

During these few minutes a maintenance truck arrived - Chevrolet flatbed with a fuel tank on back. The man inside talked with the crane operator.

At 10:54 a.m., the crew was unloading stringers to put on the bridge supports.

At 10:57 a.m., the crane operator stopped his Dragline clearing of the southbank of the roadway.

At 11:00 a.m., the Supervisor and one of the laborers were working on the third bridge support. Two crew members were watching. The crane operator was by the crane, which was not in operation. Another member of the crew was by the crane, as well.

At 11:15 a.m., the crew had a water break. The crew looked at plans and talked about materials which were due to arrive the following Monday.

At 11:20 a.m., the diesel fuel truck left after refueling the Little Giant.

At 11:27 a.m., there was radio communication between the Supervisor of the crew and Mr. Barry M. Harriss about a problem with the setting of the stringers on the girder. The entire crew waited for the results of the discussion. The resolution of the problem involved partial nailing with permanent splicing later.

At 11:30 a.m., the crew began working with the stringers again.

At 11:34 a.m., the crew began unloading stringers, (see Appendix II-E for photograph #12), and the crane was mobilized. It moved back closer to unload the stringers.

At 11:47 a.m., the crane began hoisting six stringers over onto the first and second supports. (This was more efficient than doing it manually).

At 11:50 a.m., two crew members continue to place stringers.

At 11:51 a.m., there was a lunch break, and the crane moved back out of the roadway.

The crew started back to work at 12:30 p.m., and continued to set stringers over third and fourth supports. The crane was mobilized and began clearing the northside of the road, east of the bridge.

At 12:45 p.m., the crew set bracing boards perpendicular to the stringers.

At 12:50 p.m., the crew set stringers on the first and second supports.

At 12:52 p.m., the crane stopped operating. The operator had finished cleaning out under the bridge.

At 1:05 p.m., the Supervisor and four men set boards perpendicular across stringers on first and second supports. Crane was still stopped.

At 1:23 p.m., the crew was repacking the shim shingles and the tools, and the men were all around the Supervisor's truck. Crane was sitting idle.

At 1:30 p.m., the Supervisor told us the crew would be quitting for the day soon. (See Appendix II-E for photographs #13-19.) The flagging was set up. The crane was on site.

The crew took a break and at 2:00 p.m., the crane and materials truck were leaving the site for the yard, with the Supervisor packing to go.

It was noted that most often there were only two members of the crew working on the bridge, while the other members provided support or waited.

It was also noted that the Supervisor's Ford pick-up truck ran all day because he had to have his two-way radio on, and he did not want the battery to run down.

During a break, the Supervisor indicated to us that private industry could do the work faster than his crew, for the former has the appropriate equipment, and can, therefore, get the job done rather quickly. The Supervisor also indicated that it was the first time that any of the crew had built a bridge, with the exception of the Dragline operator.

(See Appendix II-F for analysis of Bannerville Bridge Project.)

STEP 9 - SENDING QUESTIONNAIRES TO ASPHALT PAVING COMPANIES IN PALATKA

In order to obtain the "industry perspective" with respect to prices of quantifiable amounts of material, equipment rental costs, indirect cost considerations, cost accounting procedures, etc., questionnaires were sent to seven Asphalt Paving Companies in Palatka. Only one answered questionnaire was received, which does not produce a valid sample from which to draw conclusions. (See Appendix II-G for questionnaire.)

Endnotes

1. A Study of the Construct By Contract Issue; Richard A. Franzke; Oxford Press, OR; December, 1978.

2. Ibid

3. Ibid

4. Analysis of Maintenance Costing with Emphasis on Contracting Versus Using State Forces, by G.R. Allen and F.N. Lisle, Research Scientists at the Virginia Highway and Transportation Research Council, 1982.

5. A Study of the Construct by Contract Issue; Richard A. Franzke; Oxford Press, OR; Decmeber 1978.

6. Correspondence received from the Maine Department of Transportation.

7. Analysis of Maintenance Costing with Emphasis on Contracting Versus Using State Forces, by G.R. Allen and F.N. Lisle, Research Scientists at the Virginia Highway and Transportation Research Council, 1982.

8. Ibid

APPENDIX II-A

Job: Gravel Operation

DATE	EMPLOYEE	LABOR CLASS	HOURS	EQUIPMENT	HOURS	MATERIALS USED	PIT PRODUCED
9/2	Jones	Foreman	2	4x4 Pickup	2		
	Smith	Equip Operator	7	D-6 Bulldozer	7		
	Washington	Equip Operator	7	Loader	7		
	Lincoln	Laborer	7				
				Crusher	7		
				Screen	7	300 cu yd	250 cu yd
9/5	Jones	Foreman	1	4x4 Pickup	1		
	Smith	Equip Operator	3	D-6 Bulldozer	3		
	Washington	Equip Operator	3	Loader	3		
	Lincoln	Laborer	3				
				Crusher	3		
				Screen	3	120 cu yd	100 cu yd
					TOTAL	420 cu yd	350 cu yd

■ FIGURE 1. Compilation of raw data.

FRINGE BENEFITS

Employee: Jones

		PERCENTAGE
1. Leave Days		
A. Number of vacation days	10	
B. Number of sick days	12	
C. Number of holidays	12	
D. Number of personal days	5	
Total	39	
Total divided by 260 days x 52 weeks	39/260	.1500
2. Current Year Cost of:		
A. Hospitalization Insurance	$23,375	
B. Department Payroll	$275,000	
A divided by B	23,375/275,000	.0850
3. Social Security Rate		.0665
4. Retirement Rate (current year)		.1795
TOTAL RATE		.4810

■ FIGURE 2. Calculation of fringe benefits.

Cost Analysis in Public Works Decision-Making

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COMPUTING actual costs of construction operations is important to public works departments in this period of deteriorating facilities and shrinking budgets. Contractors have performed these calculations for many years for two primary reasons: to check that a profit is realized on each activity and to serve as a reference for future bid estimates. Such estimates can also be used to advantage by public works departments.

Cost analysis (sometimes referred to as cost control, cost accounting, or cost engineering) as used in this article refers to assigning unit rates to a repetitive construction operation. Unit rate can be defined as a cost per individual quantity of construction progress. For example, erection of formwork for concrete would be on a cost per square foot basis; pouring concrete, on a cost per cubic yard; and mowing grass might be on a cost per acre basis. In these calculations "costs" are the total of all labor, equipment, and material associated with the operation under consideration.

From this definition of unit rates we get a clue as to how such rates are calculated. Let us suppose it costs $3,000 in labor, equipment, and materials to place 20 cubic yards of concrete. The unit rate of placing this concrete was $3,000 (total cost) divided by 20 cubic yards (total progress) or $150 per cubic yard.

In the public sector, cost information can be used in a number of ways. Unit rates can be employed as a basis of judging crew efficiency. (For example, one particular crew may be more proficient at placing concrete than another crew and therefore achieve a much lower rate.) Cost analysis may also be used as a basis of deciding whether a given project (or operation) should be let to contract or performed by municipal forces. Finally, unit rates of various operations may be used to estimate costs in budgetary planning for future projects. As a by-product derived from the calculation of construction costs, a manager also becomes keenly aware of the time elements involved in various construction activities and those factors that directly affect their costs. This awareness is a prerequisite in improving crew efficiency and the accurate scheduling of future activities.

Raw cost data (labor, equipment, and materials used in a particular activity) can be obtained in several ways. One method is to have each foreman carefully account for each of these categories and the actual progress made on a daily basis. This can usually be noted quite easily on the same form that contains daily payroll information.

Another method is to have a general foreman note this same information in a diary or daily work record based on his regular contact with the operation.

In either case, efforts should be made to ensure that the information obtained is accurate since the result of the cost calculations will be only as accurate as the raw data used.

Example

To illustrate how cost information can be calculated and used in public works decision-making, let us take an example of a typical operation.

Suppose a municipality has set up its own gravel operation. Based on information from the foreman's time card, we find that it took four men, five pieces of equipment, and 420 cubic yards of raw material to generate 350 cubic yards of finished gravel. We will assume raw material costs of $2.00 per cubic yard. (All figures are solely for illustrative purposes.)

The first step in this calculation is to compile the raw data on one form. This is shown in Figure 1.

Next, the fringe benefits are determined and added to the base labor rate. (In the public sector, fringe benefits are usually a significant portion of labor costs.) The scope of the calculation of fringe benefits is dependent upon the variation of benefits within the crew. In other words, if the fringe benefits are relatively uniform from man to man within the department, the percent of fringe benefits may be calculated on a departmental basis and then applied to the base labor cost. Conversely, if there is a wide variation in benefits from man to man (as in New York State, for example, where retirement benefits are divided into three separate tiers with a fairly large variation from tier to tier)

LABOR COST

PAYROLL PERIOD: 9/2 to 9/15 JOB: GRAVEL OPERATION

EMPLOYEE	LABOR CLASS	BASE HOURS	PREMIUM HOURS	BASE RATE	TOTAL WAGES	% FRINGE BENEFITS	TOTAL FRINGE	WAGES + FRINGE
JONES	FOREMAN	3	—	$7.50	$22.50	48.1	$10.82	$33.32
SMYTHE	EQUIP OPERATOR	10	—	$6.80	$68.00	38.3	$26.04	$94.04
WASHINGTON	EQUIP OPERATOR	10	—	$6.80	$68.00	43.2	$29.38	$97.38
LINCOLN	LABORER	10	—	$6.25	$62.50	41.7	$26.06	$88.56
							TOTAL	$313.30

■ **FIGURE 3. Labor costs, including fringe benefits.**

or if labor costs are a substantial portion of the operation's cost (labor intensive), then the percentage of fringe benefits should be calculated on an individual basis. Although it may seem prohibitive to perform these calculations on a per-man level, once the calculation is done, it can be used until wages or benefits change.

The method of calculating fringe benefit percentages is shown in Figure 2. Figure 3 shows the application of fringe benefits and base labor rates to arrive at a total labor cost.

Equipment rates also require careful attention. The actual cost of operating a piece of equipment on an hourly basis is not only the cost of the fuel and lubrication but also the initial cost of the equipment (including overhead and depreciation); overhaul costs; repairs; and replacement of expendable items such as tracks, blades, and tires. All of the latter are amortized over the useful life of the equipment. These rates may be obtained specifically from maintenance records on each individual piece of equipment or generally, from a source such as one of the references listed at the end of this article. Again, some judgment must be used in applying these rates to a particular piece of equipment to assure that they are reasonable.

Material costs are simply the cost of all materials used on the job as delivered to the jobsite.

Working through our example shown in Figures 1 through 4, the following totals have been calculated: $313.30 in labor, $840.00 in materials, and $561.00 in equipment for a total of $1,714.30 to produce 350 cubic yards of usable gravel. Dividing the total cost by the production (see Figure 4), we obtain a unit cost of $4.90 per cubic yard.

This value may be used several ways. First of all, this unit cost may be used to decide if it is cheaper to manufacture gravel in-house or to buy it directly from a supplier. Remember that delivery costs may play an important part in this decision.

The resulting unit rate may also be used as a comparison of variables in the operation itself. For example, a larger piece of equipment or additional men may speed production but at the cost of increased hourly rates. Does the added productivity justify the increased cost? A comparison of the resulting unit rates will tell.

These unit rates may also be used in estimating the cost or providing a known quantity of gravel and the time and resources necessary to do so.

Conclusion

Although arriving at unit costs for construction operations requires initiating a system of accounting for the various components that make up these costs, the installation and maintenance of this system is minimal when compared to its benefits.

A computer can be used to ease some of the calculations and to store information. However, as shown in the example, manual accounting and calculations can be readily performed.

As with any aid to decision-making, judgment must be exercised in using cost analysis. There is no need, for example, to calculate costs to the nearest penny if calculation to the nearest dollar suffices.

Faced by today's financial and physical conditions, public works managers are confronted with the task of trying to stretch manpower, material, and equipment beyond limits considered normal just a few years ago. Any system, such as cost analysis, which enables us to make our operations more efficient, more effective, and more productive, should certainly be considered. □□□

References

1. Kavanaugh, T.C., Muller, F. and O'Brien, J.J., *Construction Management*, McGraw-Hill Book Company, New York, NY 1978.
2. Ward, S.A., and Litchfield, T., *Cost Control in Design and Construction*, McGraw-Hill Book Company, New York, NY, 1980.
3. "Dodge Cost Information Systems," McGraw-Hill Information Systems Co., New York, NY. Published annually
4. "Means Cost Data," R.S. Means Co., Kingston, MA. Published annually.
5. "Cost Reference Guide for Construction Equipment," Nielson/Dataquest, Inc., Palo Alto, CA. Published annually.

■ **FIGURE 4. Summary totals equipment and material costs and computes unit rate.**

EQUIPMENT COSTS

EQUIPMENT	DATE	HOURS	TOTAL HOURS	HOURLY RATE	TOTAL COST
4 x 4 PICKUP	9/2	2			
	9/5	1	3	$4.33	$13.00
D-6 BULLDOZER	9/2	7			
	9/5	3	10	$16.75	$167.50
LOADER	9/2	7			
	9/5	3	10	$9.75	$97.50
CRUSHER	9/2	7			
	9/5	3	10	$20.00	$200.00
SCREEN	9/2	7			
	9/5	3	10	$8.25	$82.50
				TOTAL	$561.00

UNIT RATE

Total Labor = $313.30

Total Materials = 840.00

Total Equipment = 561.00

Total Cost = $1714.30

Total Cost / Total Production = Unit Rate

$1714.30 / 350 cu. yd. = $4.90/cu. yd.

MATERIAL COSTS

DATE	QUANTITY USED	UNIT COST	TOTAL COST
9/2	300 cu yd	$2/cu yd	$600.00
9/5	120 cu yd	$2/cu yd	$240.00
		TOTAL	$840.00

APPENDIX II-B

Reporting forms used by the Putnam County Public Works Department

EQUIPMENT USE REPORT

Date _____

Equip. No. _____ Equip. Type _____

Gas _____ Diesel _____ Oil _____ Grease _____

Trans. _____ Hyd Fld _____ Tires _____ Other _____

Speedometer Reading: Hour Meter Reading:

Start _____ Finish _____ Start _____ Finish _____

Miles _____ Hours _____

MATERIAL	FROM	TO	NO. LOADS

Work Kind _____ Dist. No. _____

Location _____

Road Name	Time

Delay Hours _____ Cause (Describe) _____

Operator _____

Time In _____ Time Out _____

PCRD-56

Approved By

_____

Supervisor

OPERATOR PRE FLIGHT CHECK LIST

Operator _____ Time _____ AM PM

✓		
☐	Oil	Amt. Added _____
☐	Radiator	Amt. Added _____
☐	Transmission	Amt. Added _____
☐	Power Steering	Amt. Added _____
☐	Hydraulics	Amt. Added _____
☐	Brakes	Good ☐ Fair ☐ Poor ☐
☐	Tires or Tracks	Remarks _____
☐	Lights	
	Head	Remarks _____
	Clearance	Remarks _____
	Turn Signals	Remarks _____
☐	Horn	Remarks _____
☐	Batteries	Remarks _____
	Water	Remarks _____
	Terminals	Remarks _____
☐	Mirrors	Remarks _____
☐	Wipers	Remarks _____
☐	Windshield	Cleaned ☐
☐	Inside Cab	Cleaned ☐
☐	Air Tanks Drained	
☐	All Belts	Remarks _____
☐	Air Filter	Remarks _____

Shop Date In _____ Time In _____

Date Out _____ Time Out _____

Repairs Needed _____

_____

_____

Remarks _____

_____

COVE DRIVE WORK RECORD

Material — Labor — Equipment — 12,058.63 (2)

Date	[illegible]	Fuel	Capl.	Amt.	Hrs.	Amt.	Truck	Gr.	Bd	[illegible]	[illegible]	Cost	Total
11-26-80		97.20		97.20	62	326.40	1460	7200			20.00	232.60	1270.83
12-2-80			326.71	326.71	50	250.74	5720	7200			32.95	152.15	1433.43
12-1-80			202.06	202.06	50	223.33	5720	72.00			22.95	152.15	1080.97
12-3-80			119.69	119.69	48	232.36	5720				20.00	77.20	451.02
12-5-80			134.57	134.57	48	223.42	57.20				20.00	77.20	945.91
12-4-80			153.94	153.94	52	273.43	57.20	7200			20.00	149.20	5327.53
12-8-80			135.59	135.59	64	254.68	60.00	72.00			20.00	132.00	6019.80
12-9-80					48	235.20		7200			20.00	92.00	6377.00
12-10-80			105.01	105.01	72	342.00	60.00	7200			20.00	132.00	6756.01
1-2-81					6	26.08	109.20					109.20	7092.09
1-16-81					4	17.92	72.80					72.80	7182.81
2-18-81					9	40.26					7.50	7.50	7230.57
2-19-81		13.50		13.50	56	261.44	40.00				40.00	80.00	7584.99
2-20-81	305.85			305.85	8	34.64	40.00				40.00	40.00	7,885.48
2-20-81					48	192.36					20.00	20.00	8102.81
2-25-81					28	137.73					20.00	21.00	8260.57
2-28-81			59.38	59.38	8	47.36	57.20					57.20	8444.51
2-27-81					40	146.14					20.00	20.00	8590.65
3-3-81		97.20		97.20	5½	28.16	61.75	18.45				80.20	8796.20
9-10-81					15	66.67	21.45				15.20	36.65	8899.52
9-17-81					16	69.56					15.30	15.30	8984.38
9-18-81		59.38	47.92	107.30	20	86.95					1.90	1.90	9,197.63

Cove Drive · [illegible] · 5-25-76 · [illegible] 0.60

EQUIPMENT WORK RECORD

Grader # 128

-4-82 West Lucie Rd - Cedar St - Mulberry St - Register Dairy Rd. Price St.
-5-82 Bostwick Cemetary Rd. Millican Rd
-6-82 Millican
7-82 Bonnerville - W. Harbor Dr - Cheffy - G. Wilkins - Poor Farm
-8-82 Johns Rd.
-11-82 Carraway Mill Rt - Conaway Church Rd.
-12-82 Old Stark Rd.
13-82 Down
14-82 Down
15-82
18-82 Down
19-82 Old Stark Rd. (Down 1½ hrs. (Went home Sick)
20-82
21-82 Old Stark - Wilkinson
-22-82 Springside Cut off - Springside Trailer Park - East St. Fulton
-25-82 Keystone - Power Line - Odom - Comer.
-26-82 Comer Rd - Johns Rd -
-27-82 Bonnerville Rd - Providence Church Rd.
-28-82 Providence Ch. Rd. - Harfom Cemetary Rd - Manning Rd.
-29-82 Sun Garden Tower, Sun Garden Rd

Name Of Equip.	No. of Equip.	Hourly Cost	Daily Cost
12yd Dump Truck	3	$10.35	$82.80
	9	"	"
	10	"	"
	11	"	"
	12	"	"
	27	"	"
	28	"	"
	29	"	"
	35	"	"
12yd New Dump Truck	156	$15.70	$125.60
	157	"	"
Syd Dump Truck	25	$5.00	$40.00
	26	"	"
Pick-Up	5	$2.50	$20.00
	14	"	"
	15	"	"
	16	"	"
	17	"	"
	19	"	"
	50	"	"
	51	"	"
	52	"	"
	57	"	"
	59	"	"
Labor Truck	6	$3.80	$30.40
	8	"	"
	22	"	"
	33	"	"
LowBoy	18	$18.20	$145.60
Dozers	77	$28.60	$228.80
Backhoes	64	$11.35	$90.80
	100	~~$21.10~~ 21.90	~~$168.80~~
	101	~~$22.75~~ 23.75	~~$182.00~~
	151	$35.40	$283.20
Loaders	70	$18.35	$146.80
	72	$17.85	$142.80
	74	$13.65	$109.20
Bros Pulvi-Mixer	141	$25.85	$206.80
Tractor& Pullbroom	69&80	$3.50	$28.00
Distributor	20	$10.35	$82.80
3 Wheeler Roller	76	$9.00	$72.00
Roller	78	$7.25	$58.00
	85	$4.25	$34.00
	30	$8.00	$64.00
	61	$4.00	$32.00
	62	"	"
	63	"	"
	65	$4.75	$38.00
	67	"	"
	130	$8.75	$70.00
	120	$14.90	$119.20
	128	$12.30	$98.40

		1	2	3	4	5	6
		HOUR	DAY	WEEK	MONTH		
1	PICKUPS ½ TON	322	2575				
2	PICKUPS ¾ TON	340	2720				
3	FLATBED 1½ TON	360	2875				
4	DUMP TRUCK 5 CY	1500	12000				
5	DUMP TRUCK 12 CY	2938	23500				
6	ASPHALT DIST.	1965	15720		167000		
7	SAND SPREADER	1313	10500				
8	TRAFFIC ROLLER	3625	29000				
9	STEEL ROLLER 3-WHEEL	2170	17360				
10	GRADER	6375	51000				
11	TRACTOR & MOWER	1491	11930				
12	ASPHALT SPREADER	4500	36000				
13	ASPHALT PLANT	19827	158616				
14	DRAGLINE KOEHRING	8509	68075				
15	DRAGLINE LITTLE GIANT	6400	51200				
16	DROTT BACKHOE	4625	37000				
17	SMALL GRADER	3600	28800				
18	SEDANS	325	2600				
19	CONC. MIXER 8 C.F.	1166	9325				
20	BROS. MIXER	10188	81500				
21	TANDEM ROLLER	2160	17280				
22	580 CASE LOADER	1850	14800				
23	920 LOADER	4313	34500				
24	930 LOADER	7125	57000				
25	JD. 544B LOADER	4750	38000				
26	JD SCRAPER	7250	58000				
27	D-5 DOZER	5313	42500				
28	D-7 DOZER	11625	93000				
29	LIEBHERR	6125	49000				
30	660 GRADALL	8063	64500				
31	HOPTO	4500	36000				
32	LOWBOY & TRACTOR	4000	32000				
33	BROOM	1119	8950				
34	WATER TRUCK	1131	9050				
35	CHIPPER	1034	8275				
36	SCALES	969	7750				
37	CURB MACHINE	338	2704				
38							

APPENDIX II-C

PUTNAM COUNTY BOARD OF COMMISSIONERS

APPROPRIATION AND EXPENDITURE REPORT

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT OF BUD.
630524100	CONTRACTUAL SERVICES	500.00	.00	.00	500.00	100.000
630540100	BUILDINGS AND STRUCTURES	2,000.00	.00	1,948.00	52.00	2.600
630540200	EQUIPMENT	150.00	.00	114.00	36.00	24.000
630579900	RESERVES	.01	.00	.00	.01	100.000
		22,056.60	.00	19,249.41	2,807.19	
		4,483,048.00	.00	4,329,225.36	154,622.64	FUND TOTALS
	02 ROAD AND BRIDGE FUND					
	022101 BOARD OF CNTY COMM					
210170100	RESERVE FOR CONTINGENCY	.00	.00	.00	.00	.000
		.00	.00	.00	.00	
	024101 ENGINEERING					
410110200	SALARIES AND WAGES-OTHER EMPLOYEES	73,289.36	.00	71,044.17	2,245.19	[illegible]
410110500	MATCHING COSTS	13,957.41	.00	13,478.65	478.76	[illegible]
410110600	GROUP INSURANCE	2,071.20	.00	1,821.64	249.56	12.049
410120100	GASOLINE, OIL AND LUBRICANTS	1,324.54	.00	1,323.67	.87	[illegible]
410120400	MISCELLANEOUS SUPPLIES AND EXPENSES	383.91	.00	365.05	18.86	4.913
410120501	OFFICE SUPPLIES AND EXPENSES	1,475.00	.00	1,4[illegible].99	[illegible]	.675
410120502	PRINTING-DRAFTING SUPPLIES	800.00	.00	797.53	2.47	.309
410120700	TOOLS AND SMALL IMPLEMENTS	.00	.00	.00	.00	.000
410132800	AUTO ALLOWANCE AND TRAVEL	1,905.75	.00	1,895.75	10.00	.524
410132900	DUES AND MEMBERSHIP	100.00	.00	25.00	75.00	75.000
410133200	SUBSCRIPTIONS	50.00	.00	.00	50.00	100.000
410133300	ADVERTISING	100.00	.00	21.35	78.65	78.650
410133900	MAINTENANCE OF EQUIPMENT	1,400.00	.00	1,164.03	235.97	16.855
410134100	CONTRACTUAL SERVICES	243.00	.00	.00	243.00	100.000
410140200	EQUIPMENT	4,497.39	.00	4,435.95	[illegible].43	1.3[illegible]
		121,498.55	.00	117,787.78	3,710.77	
	024102 ROADS + BRIDGES					
410210201	SALARY-SUPERINTENDANT	18,292.99	.00	18,292.99	.00	.000
410210202	SALARIES AND WAGES-OTHER EMPLOYEES	612,337.39	.00	606,005.24	6,332.15	1.034
410210500	MATCHING COSTS	101,341.25	.00	92,919.51	8,422.74	8.311
410210600	GROUP INSURANCE	40,050.92	.00	39,979.40	71.52	.179
410220100	GASOLINE, OIL AND LUBRICANTS	94,000.00	.00	93,[illegible].81	659.19	.701
410220300	MATERIALS	154,228.01	.00	145,969.13	8,258.88	5.355
410220400	MISCELLANEOUS EXPENSES	2,000.00	.00	1,507.27	492.73	24.636
410220500	OFFICE SUPPLIES	2,956.00	.00	2,879.76	76.24	2.579
410220700	TOOLS AND SMALL IMPLEMENTS	1,700.00	.00	1,664.29	35.71	2.101

APPROPRIATION AND EXPENDITURE REPORT

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT EXP.
410220900	MEDICAL AND SURGICAL EXPENSES	2,075.00	.00	1,824.28	250.72	12.0
410233300	AUTO ALLOWANCE AND TRAVEL	5,350.00	.00	4,726.28	623.72	11.66
410233900	DUES AND MEMBERSHIP	50.40	.00	.00	50.40	.0
410233000	INSURANCE AND BONDS	30.00	.00	30.00	.00	.0
410233100	RENTAL	5,000.00	.00	4,223.60	776.40	15.0
410233200	ADVERTISING	100.00	.00	87.10	12.90	13.0
410233400	COMMISSIONS AND FEES	827.30	.00	827.30	.00	.0
410233700	MAINTENANCE OF BUILDINGS AND GROUNDS	3,600.00	.00	3,155.10	444.90	12.3
410233800	MAINTENANCE OF EQUIPMENT	119,007.42	.00	117,841.55	1,165.87	.9
410234000	UTILITIES	25,242.58	.00CR	26,748.28	.00	.0
410234100	CONTRACTUAL SERVICES	27,000.00	.00	26,181.25	818.75	3.0
410240100	BUILDINGS AND STRUCTURES	1,600.00	.00	1,154.62	445.38	27.8
410240200	EQUIPMENT	195,074.32	.00	174,075.22	21,999.10	11.2
410240500	SAFETY MARKING	15,000.00	.00	14,637.81	362.19	2.4
410240501	SAFETY EQUIPMENT AND SUPPLIES	1,150.00	.00	1,007.79	142.21	12.3
		1,429,667.18	.00	1,371,945.77	57,721.41	
		1,551,169.73	.00	1,404,733.53	96,432.18	FUND TOTALS

04 BOND INTEREST SINKING FUND*GENERAL

048110 BOND INT SF-GEN

811050100	PRINCIPAL	70,000.00	.00	70,000.00	.00	.0
811050200	INTEREST	13,912.50	.00	13,912.50	.00	.0
811050300	EXPENSES	300.00	.00	141.75	158.25	52.7
811079600	RESERVES	95,000.00	.00	.00	95,000.00	100.0
		179,212.50	.00	84,054.25	95,158.25	
		179,212.50	.00	84,054.25	95,158.25	FUND TOTALS

07 PUBLIC IMPROVEMENTS CERTIFICATES SINK.FND

078110 PUBLIC IMP CTFS SF

811030500	RACE TRACK DISTRIBUTION	124,839.00	.00	124,839.00	.00	.0
811050150	PRINCIPAL	75,000.00	.00	75,000.00	.00	.0
811050200	INTEREST	116,255.00	.00	116,255.00	.00	.0
811050100	TRANSFER TO GENERAL FUND	152,031.00	.00	152,031.00	.00	.0
811079600	RESERVES	191,000.00	.00	.00	191,000.00	100.0
		658,675.00	.00	467,475.00	191,000.00	
		658,675.00	.00	467,475.00	191,000.00	FUND TOTALS

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCNT OF BUD.
210130400	PAYMENTS TO MUNICIPALITIES	59,056.41	.00	59,056.41	.00	.000
		59,056.41	.00	59,056.41	.00	
	024101 ENGINEERING					
410110200	SALARIES AND WAGES-OTHER EMPLOYEES	104,881.47	.00	102,011.48	2,869.99	2.736
410110600	MATCHING COSTS	15,760.87	.00	14,148.71	1,612.16	10.229
410110800	GROUP INSURANCE	3,442.56	.00	3,254.64	187.92	5.459
410120100	GASOLINE, OIL AND LUBRICANTS	1,524.10	.00	1,157.28	366.82	24.068
410120400	MISCELLANEOUS SUPPLIES AND EXPENSES	417.01	.00	417.01	.00	.000
410120501	OFFICE SUPPLIES AND EXPENSES	1,100.00	.00	1,092.72	7.28	.662
410120502	PRINTING-DRAFTING SUPPLIES	260.00	.00	259.14	.86	.331
410120700	TOOLS AND SMALL IMPLEMENTS	100.00	.00	.00	100.00	100.000
410132900	AUTO ALLOWANCE AND TRAVEL	1,900.00	.00	1,626.25	273.75	14.406
410132900	DUES AND MEMBERSHIP	100.00	.00	35.00	65.00	65.000
410133200	SUBSCRIPTIONS	50.00	.00	.00	50.00	100.000
410133300	ADVERTISING	.00	.00	.00	.00	.000
410133900	MAINTENANCE OF EQUIPMENT	1,333.92	.00	1,183.92	150.00	11.245
410134100	CONTRACTUAL SERVICES	243.00	.00	.00	243.00	100.000
410140200	EQUIPMENT	43,273.95	.00	43,158.29	115.66	.267
		174,386.88	.00	168,344.44	6,042.44	
	024102 ROADS + BRIDGES					
410210201	SALARY-SUPERINTENDANT	19,899.92	.00	18,899.92	.00	.000
410210202	SALARIES AND WAGES-OTHER EMPLOYEES	798,522.04	.00	736,428.44	62,093.60	7.776
410210600	MATCHING COSTS	121,990.73	.00	113,164.53	8,826.20	7.235
410210800	GROUP INSURANCE	58,675.20	.00	51,855.80	6,819.40	11.622
410220100	GASOLINE, OIL AND LUBRICANTS	118,289.50	.00	111,449.48	6,840.02	5.782
410220300	MATERIALS	172,121.70	.00	158,022.62	14,098.88	8.191
410220400	MISCELLANEOUS EXPENSES	2,200.00	.00	2,147.44	52.56	2.389
410220500	OFFICE SUPPLIES	2,950.00	.00	2,640.58	309.42	10.489
410220700	TOOLS AND SMALL IMPLEMENTS	2,400.00	.00	2,209.93	190.07	7.920
410220900	MEDICAL AND SURGICAL EXPENSES	2,850.00	.00	2,368.98	481.02	16.878
410232800	AUTO ALLOWANCE AND TRAVEL	7,000.00	.00	6,296.19	703.81	10.054
410232900	DUES AND MEMBERSHIP	50.00	.00	.00	50.00	100.000
410233100	RENTAL	6,000.00	.00	4,433.60	1,566.40	26.107
410233300	ADVERTISING	200.00	.00	86.40	113.60	56.800
410233400	COMMISSIONS AND FEES-UNEMPLOYMENT COMP	2,000.00	.00	970.32	1,029.68	51.484
410233700	MAINTENANCE OF BUILDINGS AND GROUNDS	4,000.00	.00	1,810.24	2,189.76	54.744
410233800	MAINTENANCE OF EQUIPMENT	171,435.00	.00	166,578.61	4,856.39	2.833
410234000	UTILITIES	73,500.00	.00	70,665.31	2,834.69	3.857
410234100	CONTRACTUAL SERVICES	32,800.00	.00	30,633.10	2,166.90	6.606
410240100	BUILDINGS AND STRUCTURES	1,500.00	.00	485.57	1,014.43	67.629
410240200	EQUIPMENT	145,126.25	.00	119,337.94	25,788.31	17.770
410240500	SAFETY MARKING	18,500.00	.00	18,342.75	157.25	.850
410240501	SAFETY EQUIPMENT AND SUPPLIES	1,500.00	.00	1,488.32	11.68	.779
		1,762,510.34	.00	1,620,316.27	142,194.07	

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCNT OF BUD.
	029990 RESERVES					
999070100	RESERVE FOR CONTINGENCY	7,634.46	.00	.00	7,634.46	100.000
		7,634.46	.00	.00	7,634.46	
		2,003,588.09	.00	1,847,717.12	155,870.97	FUND TOTALS
	03 TRANSPORTATION TRUST FUND — 5th & 6th ¢ gas tax.					
	034102 TRANSPORTATION TRST FND					
410220100	GASOLINE, OIL AND LUBRICANTS	300.00	.00	195.26	104.74	34.913
410220400	MISCELLANEOUS SUPPLIES AND EXPENSES	105.34	.00	105.34	.00	.000
410220501	OFFICE SUPPLIES AND EXPENSES	500.00	.00	463.70	36.30	7.260
410220502	PRINTING AND DRAFTING SUPPLIES	1,020.16	.00	843.82	176.34	17.286
410220700	TOOLS AND SMALL IMPLEMENTS	750.00	.00	21.45	728.55	97.140
410233300	ADVERTISING	300.00	.00	46.45	253.55	84.517
410233900	MAINTENANCE OF EQUIPMENT	300.00	.00	9.79	290.21	96.737
410234100	CONTRACTUAL SERVICES	326,724.50	.00	14,213.00	311,511.50	95.386
		329,000.00	.00	15,898.81	313,101.19	
		329,000.00	.00	15,898.81	313,101.19	FUND TOTALS
	04 BOND INTEREST SINKING FUND*GENERAL					
	048110 BOND INT SF-GEN					
811050100	PRINCIPAL	70,000.00	.00	70,000.00	.00	.000
811050200	INTEREST	11,300.00	.00	11,300.00	.00	.000
811050300	EXPENSES	350.00	.00	152.86	197.14	56.326
811079500	RESERVES	98,888.00	.00	.00	98,888.00	100.000
		180,538.00	.00	81,452.86	99,085.14	
		180,538.00	.00	81,452.86	99,085.14	FUND TOTALS
	07 PUBLIC IMPROVEMENTS CERTIFICATES SINK.FND					
	078110 PUBLIC IMP CTFS SF					

PUTNAM COUNTY BOARD OF COMMISSIONERS — PAGE [illegible]

APPROPRIATION AND EXPENDITURE REPORT — 28/09/7[illegible]

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT OF ENC.
	101 TRANSPORTATION FUND					
	1012[illegible] BOARD OF COUNTY COMM					
21015199100	PAYMENTS TO MUNICIPALITIES	55,000.00	.00	46,296.62	8,703.38	15.821
		55,000.00	.00	46,296.62	8,703.38	
	1[illegible] ENGINEERING					
[illegible]	REGULAR SALARIES + WAGES	94,932.65	.00	72,263.45	18,669.20	24.917
[illegible]	SOCIAL SECURITY MATCHING	5,372.50	.00	4,316.84	1,055.66	20.940
[illegible]	RETIREMENT CONTRIBUTIONS	7,870.37	.00	6,576.02	1,294.35	16.446
[illegible]	LIFE + HEALTH INSURANCE	4,941.52	.00	2,469.42	2,472.10	50.027
[illegible]	TRAVEL + PER DIEM	1,660.00	.00	1,479.27	180.73	10.887
[illegible]	TRANSPORTATION	140.00	.00	133.80	6.20	4.429
[illegible]	REPAIR + MAINTENANCE SERVICE	1,475.00	.00	1,133.38	341.62	9.6[illegible]
[illegible]	PRINTING + BINDING	500.00	.00	297.50	202.50	40.[illegible]
[illegible]	OTHER CURRENT CHARGES + OBLIGATIONS	135.00	.00	132.20	2.80	2.074
[illegible]	OTHER CHARGES AND OBLIGATIONS	1,131.10	.00	1,131.10	.00	.000
[illegible]	OFFICE SUPPLIES	1,200.00	.00	1,122.87	77.13	6.428
[illegible]	OPERATING SUPPLIES	2,370.00	.00	2,185.68	184.32	7.769
[illegible]	BOOKS, PUBS, SUBS + MEMBERSHIPS	210.00	.00	205.16	4.84	2.305
[illegible]	MACHINERY + EQUIPMENT	5,155.00	.00	4,632.37	522.63	10.[illegible]
		115,963.14	.00	96,305.26	19,653.88	
	[illegible] ROADS + BRIDGES					
[illegible]	SUPERINTENDENT SALARY	21,355.97	.00	21,355.97	.00	.000
[illegible]	REGULAR SALARIES + WAGES	719,410.56	.00	659,493.79	59,916.77	8.328
[illegible]	SOCIAL SECURITY MATCHING	48,206.81	.00	41,554.79	6,652.02	13.799
[illegible]	RETIREMENT CONTRIBUTIONS	77,[illegible].62	.00	63,[illegible].19	1[illegible],474.[illegible]	1[illegible]
[illegible]	LIFE + HEALTH INSURANCE	75,204.62	.00	47,760.40	27,444.22	36.493
[illegible]	PROFESSIONAL SERVICES	2,450.00	.00	2,264.60	[illegible]	7.[illegible]
[illegible]	OTHER CONTRACTUAL SERVICES	40,500.00	.00	40,230.71	269.29	.6[illegible]
[illegible]	OTHER CONTRACTUAL SERVICES-ROAD CONTRACT	56,000.00	.00	.00	56,000.00	100.000
[illegible]	TRAVEL + PER DIEM	6,000.00	.00	5,988.74	11.26	.188
[illegible]	UTILITY SERVICES	64,750.00	.00	55,230.43	9,519.57	1[illegible]
[illegible]	RENTALS + LEASES	6,000.00	.00	3,420.50	2,579.50	42.992
[illegible]	REPAIR + MAINTENANCE SERVICE	167,955.00	.00	165,658.79	2,296.21	1.367
[illegible]	OTHER CURRENT CHARGES + OBLIGATIONS	2,600.00	.00	1,594.63	1,005.37	38.6[illegible]
[illegible]	OFFICE SUPPLIES	2,600.00	.00	2,560.43	39.57	1.449
[illegible]	OPERATING SUPPLIES	152,856.00	.00	146,660.83	[illegible]	3.5[illegible]
[illegible]	ROAD MATERIALS + SUPPLIES	184,250.00	.00	169,627.31	14,622.69	7.9[illegible]
[illegible]	BOOKS, PUBS, SUBS + MEMBERSHIPS	50.00	.00	18.00	32.00	64.000
[illegible]	BUILDINGS	975.00	.00	.00	975.00	100.000
[illegible]	MACHINERY + EQUIPMENT	199,866.68	.00	197,334.01	2,532.67	1.267
		1,924,069.62	.00	1,624,673.21	199,414.41	

PUTNAM COUNTY BOARD OF COMMISSIONERS

APPROPRIATION AND EXPENDITURE REPORT

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT OF TOT.
	[illegible] RESERVES					
[illegible]	RESERVE FOR CONTINGENCIES	9,738.60	.00	.00	9,738.60	100.000
		9,738.60	.00	.00	9,728.60	
		3,005,790.36	.00	1,769,081.69	236,708.67	FUND TOTALS
	[illegible] TRANSPORTATION TRUST FUND → fund of 6¢ gas tax.					
	[illegible] [illegible] GA. TX [illegible] OVER [illegible]					
[illegible]	OTHER CONTRACTUAL SERVICES	479,000.00	.00	364,657.35	110,342.65	23.[illegible]
[illegible]	REPAIR + MAINTENANCE SERVICE	[illegible].00	.00	.00	[illegible]	[illegible]
[illegible]	PRINTING + BINDING	500.00	.00	.00	[illegible]	[illegible]
[illegible]	OTHER CURRENT CHARGES + OBLIGATIONS	1,000.00	.00	.00	1,[illegible]	[illegible]
[illegible]	OFFICE SUPPLIES	500.00	.00	250.09	245.91	45.[illegible]
[illegible]	OPERATING SUPPLIES	1,000.00	.00	443.26	556.74	55.674
		479,380.00	.00	365,350.70	112,945.30	
		479,380.00	.00	365,350.70	112,945.30	FUND TOTALS
	[illegible] FEDERAL REVENUE SHARING TRUST FUND					
	[illegible] BOARD OF COUNTY COMM					
[illegible]	INSURANCE	250,512.30	.00	245,996.30	4,516.00	[illegible]
		250,512.30	.00	245,996.30	4,516.00	
	[illegible] COUNTY BUILDINGS					
[illegible]	[illegible] + PUBLIC INSURANCE	[illegible]	.00	4,[illegible]	[illegible]	40.[illegible]
[illegible]	OTHER CONTRACTUAL SERVICES	[illegible]	.00	[illegible]	[illegible]	[illegible]
[illegible]	UTILITY SERVICES	[illegible]	.00	54,772.22	5,227.78	[illegible]
[illegible]	RENTALS + LEASES	225.00	.00	41.00	184.00	[illegible]
[illegible]	REPAIR + MAINTENANCE SERVICES	11,495.00	.00	7,619.00	3,537.00	33.[illegible]
[illegible]	OTHER CURRENT CHARGES AND OBLIGATIONS	70.00	.00	65.[illegible]	[illegible]	[illegible]
[illegible]	OPERATING SUPPLIES	4,[illegible].00	.00	3,715.05	[illegible]	[illegible]
[illegible]	MACHINERY + EQUIPMENT	1,004.00	.00	[illegible]	341.43	34.[illegible]
		119,312.96	.00	105,183.80	13,629.16	

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT OF BUD.
2*C15152100	PAYMENTS TO MUNICIPALITIES	65,000.00	.00	52,750.90	12,249.10	18.845
		65,000.00	.00	52,750.90	12,249.10	
	1014101 ENGINEERING					
41015411200	REGULAR SALARIES + WAGES	66,902.78	.00	66,525.72	378.06	.565
41015412100	SOCIAL SECURITY MATCHING	4,154.37	.00	4,076.48	77.89	1.874
41015412200	RETIREMENT CONTRIBUTIONS	6,170.13	.00	6,053.86	116.27	1.884
41015412300	LIFE + HEALTH INSURANCE	3,016.10	.00	2,668.98	347.12	11.509
41015413400	CONTRACT SERVICES	4,770.95	.00	4,015.00	755.95	15.845
41015414000	TRAVEL + PER DIEM	.00	.00	.00	.00	.000
41015414300	TRANSPORTATION	250.00	.00	199.81	50.19	20.076
41015414400	RENTALS AND LEASES	900.00	.00	793.50	106.50	11.833
41015414600	REPAIR + MAINTENANCE SERVICE	2,450.00	.00	2,405.90	44.10	1.800
41015414700	PRINTING + BINDING	850.00	.00	665.25	184.75	21.735
41015414900	OTHER CURRENT CHARGES + OBLIGATIONS	100.00	.00	38.40	61.60	61.600
41015415100	OFFICE SUPPLIES	950.00	.00	786.30	163.70	17.232
41015415200	OPERATING SUPPLIES	4,171.43	.00	3,771.29	400.14	9.592
41015415400	BOOKS, PUBLS, SUBS + MEMBERSHIPS	250.00	.00	38.54	211.46	84.584
41015416400	MACHINERY + EQUIPMENT	5,153.00	.00	5,127.42	25.58	.496
		100,091.76	.00	97,168.45	2,923.31	
	1014102 ROADS + BRIDGES					
41025411201	SUPERINTENDENT SALARY	22,149.16	.00	21,297.50	851.66	3.845
41025411202	REGULAR SALARIES + WAGES	750,699.54	.00	734,006.73	16,692.81	2.223
41025412100	SOCIAL SECURITY MATCHING	49,311.43	.00	46,384.68	2,926.75	5.935
41025412200	RETIREMENT CONTRIBUTIONS	73,202.94	.00	69,039.99	4,162.95	5.686
41025412300	LIFE + HEALTH INSURANCE	58,555.20	.00	58,279.47	275.73	.471
41025413100	PROFESSIONAL SERVICES	2,879.00	.00	2,770.29	108.71	3.776
41025413400	OTHER CONTRACTUAL SERVICES	55,675.00	.00	49,056.05	6,618.95	11.889
41025414000	TRAVEL + PER DIEM	8,322.23	.00	8,116.48	106.75	1.298
41025414300	UTILITY SERVICES	50,075.00	.00	46,053.33	4,021.67	8.031
41025414400	RENTALS + LEASES	7,750.00	.00	7,714.54	35.46	.458
41025414600	REPAIR + MAINTENANCE SERVICE	229,933.00	.00	224,803.74	4,129.26	1.851
41025414900	OTHER CURRENT CHARGES + OBLIGATIONS	6,373.00	.00	5,762.02	212.98	5.152
41025415100	OFFICE SUPPLIES	2,640.00	.00	2,398.01	241.99	9.166
41025415200	OPERATING SUPPLIES	266,911.75	.00	261,501.85	5,409.90	1.877
41025415300	ROAD MATERIALS + SUPPLIES	180,232.00	.00	147,856.76	32,356.24	17.975
41025415400	BOOKS, PUBLS, SUBS + MEMBERSHIPS	50.00	.00	3.75	46.25	92.500
41025416200	BUILDINGS	306.67	.00	289.00	17.67	6.456
41025416400	MACHINERY + EQUIPMENT	163,911.81	.00	161,653.15	2,258.66	1.256
		1,927,370.73	.00	1,847,362.84	80,298.39	
	1019999 RESERVES					
5999501000	RESERVE FOR CONTINGENCIES	48,260.50	.00	.00	48,260.50	100.000

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCNT OF BUD.
		48,260.50	.00	.00	48,260.50	
		2,140,922.99	.00	1,997,281.69	143,641.30	FUND TOTALS
	102 TRANSPORTATION TRUST FUND					
	1026102 FOR GAS TX POUR OVER FD					
41026412100	PROFESSIONAL SERVICES	1,500.00	.00	1,500.00	.00	.000
41026412400	OTHER CONTRACTUAL SERVICES	569,600.00	.00	71,965.88	497,634.20	87.366
41026414900	OTHER CURRENT CHARGES AND OBLIGATIONS	50.00	.00	.00	50.00	100.000
41026415100	OFFICE SUPPLIES	250.00	.00	205.63	44.37	17.748
41026415200	OPERATING SUPPLIES	1,600.00	.00	1,257.69	342.31	21.394
		573,000.00	.00	74,929.12	498,070.88	
		573,000.00	.00	74,929.12	498,070.88	FUND TOTALS
	111 FEDERAL REVENUE SHARING TRUST FUND					
	1112101 BOARD OF COUNTY COMM					
21011114500	INSURANCE	245,586.90	.00	244,137.25	1,449.65	.590
21011114900	OTHER CURRENT CHARGES AND OBLIGATIONS	7.77	.00	7.77	.00	.000
		245,594.67	.00	244,145.02	1,449.65	
	1112551 DATA PROCESSING					
25511914600	REPAIR AND MAINTENANCE	20,500.00	.00	20,077.50	422.50	2.061
25511915200	OPERATING SUPPLIES	10,678.00	.00	10,584.02	93.98	.880
		31,178.00	.00	30,661.52	516.48	
	1112670 COUNTY BUILDINGS					
26705192300	LIFE + HEALTH INSURANCE	5,812.36	.00	5,253.96	558.40	9.607
26705193400	OTHER CONTRACTUAL SERVICES	35,810.00	.00	35,800.70	9.30	.026
26705194002	TRAVEL AND PER DIEM-OUT OF COUNTY	247.00	.00	136.47	110.53	44.749
26705194300	UTILITY SERVICES	83,537.00	.00	72,593.04	10,943.96	13.101
26705194400	RENTALS + LEASES	476.88	.00	476.88	.00	.000
26705194600	REPAIR + MAINTENANCE SERVICE	9,871.12	.00	9,659.42	211.70	2.145
26705194900	OTHER CURRENT CHARGES AND OBLIGATIONS	100.00	.00	52.60	47.40	47.400
26705195200	OPERATING SUPPLIES	4,550.00	.00	4,519.33	30.67	.674

PUTNAM COUNTY BOARD OF COMMISSIONERS

APPROPRIATION AND EXPENDITURE REPORT

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT OF BUD.
[illegible]	RESERVE FOR CONTINGENCIES	1[illegible],528.10	.00	.00	1[illegible],528.[illegible]	100.[illegible]
		105,528.10	.00	.00	105,528.[illegible]	
		5,379,539.00	.00	5,070,078.71	309,46[illegible].29	FUND TOTALS
	101 TRANSPORTATION FUND					
	1012[illegible] BOARD OF COUNTY COMM					
[illegible]	PAYMENTS TO MUNICIPALITIES	86,160.00	.00	86,159.93	.07	.000
		86,160.00	.00	86,159.93	.07	
	[illegible] ENGINEERING					
[illegible]	REGULAR SALARIES + WAGES	93,495.68	.00	90,704.06	2,791.62	[illegible]
[illegible]2100	SOCIAL SECURITY MATCHING	5,423.26	.00	5,423.26	[illegible]	[illegible]
[illegible]2200	RETIREMENT CONTRIBUTIONS	7,550.14	.00	7,55[illegible]	[illegible]	[illegible]
[illegible]2300	LIFE + HEALTH INSURANCE	5,313.78	.00	4,72[illegible].59	5[illegible].[illegible]	1[illegible].4[illegible]
[illegible]	CONTRACT SERVICES	2,[illegible].71	.00	1,7[illegible]	1,[illegible].7[illegible]	4[illegible]
[illegible]4000	TRAVEL + PER DIEM	15.44	.00	15.44	[illegible]	[illegible]
[illegible]	TRANSPORTATION	[illegible]	.00	[illegible]	1[illegible]	40.[illegible]
[illegible]	RENTALS AND LEASES	1,[illegible].00	.00	[illegible]	16[illegible]	16.[illegible]
[illegible]4600	REPAIR + MAINTENANCE SERVICES	1,400.00	.00	1,326.5[illegible]	75.[illegible]	5.[illegible]
[illegible]4700	PRINTING + BINDING	75.30	.00	75.30	[illegible]	.000
[illegible]4900	OTHER CURRENT CHARGES + OBLIGATIONS	150.00	.00	[illegible].50	1[illegible]	[illegible]
[illegible]	OFFICE SUPPLIES	779.0[illegible]	.00	652.10	127.[illegible]	17.[illegible]
[illegible]	OPERATING SUPPLIES	5,424.90	.00	4,[illegible]	[illegible]	11.17[illegible]
4101[illegible]5400	BOOKS, PUBS, SUBS + MEMBERSHIPS	200.00	.00	152.1[illegible]	47.[illegible]	2[illegible]
41025416400	MACHINERY + EQUIPMENT	550.00	.00	457.55	92.[illegible]	16.[illegible]
		129,9[illegible]2.[illegible]	.00	124,732.59	[illegible],2[illegible].[illegible]7	
	[illegible]4102 ROADS + BRIDGES					
[illegible]	SUPERINTENDENT SALARY	18,921.56	.00	16,962.55	1,95[illegible]	10.[illegible]
[illegible]	REGULAR SALARIES + WAGES	91[illegible],725.41	.00	[illegible]	[illegible]	[illegible]
4102[illegible]2100	SOCIAL SECURITY MATCHING	[illegible],[illegible].36	.00	[illegible],7[illegible].7[illegible]	7,[illegible]	11.[illegible]
[illegible]	RETIREMENT CONTRIBUTIONS	[illegible]	.00	7[illegible]	[illegible].07	[illegible]
[illegible]2300	LIFE + HEALTH INSURANCE	66,201.39	.00	66,[illegible]	[illegible]	[illegible]
[illegible]3100	PROFESSIONAL SERVICES	1,[illegible]00.00	.00	651.30	1,[illegible]	6[illegible]
[illegible]3400	OTHER CONTRACTUAL SERVICES	106,322.56	.00	102,[illegible].19	4,[illegible]	3.[illegible]
[illegible]	TRAVEL + PER DIEM	11,[illegible].00	.00	11,[illegible]	[illegible]	[illegible]
[illegible]4100	COMMUNICATIONS	2[illegible]3.00	.00	224.6[illegible]	[illegible]	1[illegible]
[illegible]	TRANSPORTATION	355.[illegible]	.00	[illegible]	2[illegible]	[illegible]
[illegible]4300	UTILITY SERVICES	5[illegible],670.00	.00	56,625.[illegible]	[illegible]	[illegible]
41025414400	RENTALS + LEASES	[illegible],000.00	.00	[illegible],134.4[illegible]	[illegible]65.6[illegible]	5.61[illegible]

PUTNAM COUNTY BOARD OF COMMISSIONERS

30/09/82

APPROPRIATION AND EXPENDITURE REPORT

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PRCNT OF BUD.
[illegible]	REPAIR + MAINTENANCE SERVICE	19[illegible],113.52	.00	187,514.22	[illegible],599.40	4.735
41[illegible]	OTHER CURRENT CHARGES + OBLIGATIONS	5,250.00	.00	4,402.94	847.06	16.134
[illegible]	[illegible] SUPPLIES	2,65[illegible].00	.00	2,[illegible]	[illegible].62	22.[illegible]
41 2541520[illegible]	OPERATING SUPPLIES	241,162.30	.00	239,663.46	1,499.54	.621
41[illegible]	ROAD MATERIALS + SUPPLIES	1[illegible],891.50	.00	162,925.63	17,965.87	9.930
[illegible]	BOOKS, DUES, SUBS + MEMBERSHIPS	100.00	.00	56.00	4.00	4.000
41[illegible]	BUILDINGS	100.00	.00	42.74	57.26	57.260
[illegible]	MACHINERY + EQUIPMENT	9[illegible],235.06	.00	85,142.60	[illegible],092.46	5.044
		2,[illegible],374.37	.00	1,908,656.20	144,718.10	
	1019937 RESERVES					
[illegible]	RESERVE FOR CONTINGENCIES	[illegible],854.65	.00	.00	[illegible],854.65	100.000
		60,854.65	.00	.00	60,854.65	
		2,[illegible],791.[illegible]	.00	2,[illegible],542.[illegible]	[illegible]	FUND TOTALS
	102 TRANSPORTATION TRUST FUND					
	1024107 MOT GAS TX POUR OVER FD					
41.2541310[illegible]	PROFESSIONAL SERVICES	1,500.00	.00	1,000.00	500.00	33.333
41[illegible]	OTHER CONTRACTUAL SERVICES	741,316.29	.00	715,039.15	26,277.14	3.545
[illegible]	OFFICE SUPPLIES	1,600.00	.00	.00	1,600.00	100.000
41.2541520[illegible]	OPERATING SUPPLIES	300.00	.00	.00	300.00	100.000
		744,716.29	.00	71[illegible],039.15	2[illegible],677.14	
		744,716.29	.00	716,039.15	2[illegible],677.14	FUND TOTALS
	111 FEDERAL REVENUE SHARING TRUST FUND					
	1112101 BOARD OF COUNTY COMM					
[illegible]	INSURANCE	209,456.92	.00	202,753.00	5,7[illegible].92	3.2[illegible]
[illegible]	OTHER CURRENT CHARGES AND OBLIGATIONS	[illegible]	.00	[illegible]	[illegible]	[illegible]
		209,456.92	.00	202,750.00	5,716.92	
	1112226 COUNTY COURT					
[illegible]1200	OTHER SALARIES AND WAGES	500.00	.00	240.00	260.00	52.000
[illegible]4000	TRAVEL AND PER DIEM	150.00	.00	73.90	76.10	50.733

44j

PUTNAM COUNTY BOARD OF COMMISSIONERS

APPROPRIATION AND EXPENDITURE REPORT

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCENT OF BUD.
	1113222 COUNTY JAIL					
[illegible]	OTHER CONTRACTUAL SERVICES	149.36	.00	549.36	[illegible]	[illegible]
[illegible]	REPAIR + MAINTENANCE SERVICE	17,771.02	.00	17,308.54	463.[illegible]	2.6[illegible]
[illegible]	BUILDINGS	465.00	.00	465.00	[illegible]	[illegible]
[illegible]	MACHINERY + EQUIPMENT	2,688.00	.00	2,688.00	[illegible]	[illegible]
		21,473.38	.00	21,005.90	467.48	
	1113441 BLDGS, ZONING + INSP					
[illegible]	LIFE + HEALTH INSURANCE	5,518.00	.00	4,922.53	595.47	10.[illegible]
[illegible]	OTHER CONTRACTUAL SERVICES	1,172.00	.00	1,162.00	[illegible]	[illegible]
[illegible]	TRAVEL + PER DIEM-IN COUNTY	1,500.00	.00	[illegible]	[illegible]	[illegible]
[illegible]	TRAVEL + PER DIEM-OUT OF COUNTY	339.23	.00	339.23	[illegible]	[illegible]
[illegible]	TRANSPORTATION	950.00	.00	846.90	[illegible]	.262
[illegible]	RENTALS + LEASES	9,141.00	.00	7,322.10	818.5[illegible]	10.[illegible]
[illegible]	REPAIR + MAINTENANCE SERVICE	4,321.11	.00	4,297.41	[illegible]	.775
[illegible]	PRINTING AND BINDING	1,150.00	.00	1,147.63	2.37	.206
[illegible]	OTHER CURRENT CHARGES + OBLIGATIONS	[illegible]	.00	[illegible]	[illegible]	3.719
[illegible]	OFFICE SUPPLIES	1,850.00	.00	1,774.14	75.86	4.101
[illegible]	OPERATING SUPPLIES	5,400.00	.00	6,325.13	76.57	1.207
[illegible]	BOOKS, PUBLS, SUBS + MEMBERSHIPS	2,010.77	.00	1,944.67	[illegible]	3.217
		34,262.11	.00	32,199.65	2,062.46	
	1114102 ROADS AND BRIDGES					
[illegible]	CONTRACTUAL SERVICES	14,102.29	.00	14,[illegible].28	[illegible]	[illegible]
[illegible]	REPAIR AND MAINTENANCE SERVICE	5,935.70	.00	4,982.71	[illegible]	16.056
[illegible]	OPERATING SUPPLIES	17,[illegible].36	.00	16,[illegible].75	[illegible]	4.256
[illegible]	ROAD MATERIALS AND SUPPLIES	19,874.66	.00	18,[illegible].78	1,[illegible]	6.39[illegible]
		57,747.08	.00	54,278.92	3,468.16	
	1114213 SOLID WASTE COLL. SYS.					
4212[illegible]3100	PROFESSIONAL SERVICES	150.00	.00	143.00	7.00	4.667
[illegible]	REPAIR + MAINTENANCE SERVICE	25,235.90	.00	24,490.53	745.37	2.9[illegible]
[illegible]	OTHER CURRENT CHARGES + OBLIGATIONS	26.75	.00	26.75	[illegible]	[illegible]
[illegible]	OFFICE SUPPLIES	[illegible]	.00	12.95	1[illegible]	55.5[illegible]
[illegible]	OPERATING SUPPLIES	25,569.36	.00	25,572.36	1,[illegible]	4.2[illegible]
4212[illegible]6400	MACHINERY AND EQUIPMENT	20,265.19	.00	20,[illegible].19	25[illegible]	1.2[illegible]
		71,850.00	.00	65,550.99	2,2[illegible]	
	1115103 MENTAL HEALTH					
5[illegible]3401	OTHER CONTRACTUAL SERVICES-TRI COUNTY	30,000.00	.00	30,000.00	.00	.000

We're sharing - To be used however wished.

44k

PUTNAM COUNTY BOARD OF COMMISSIONERS

APPROPRIATION AND EXPENDITURE REPORT

30/09/82

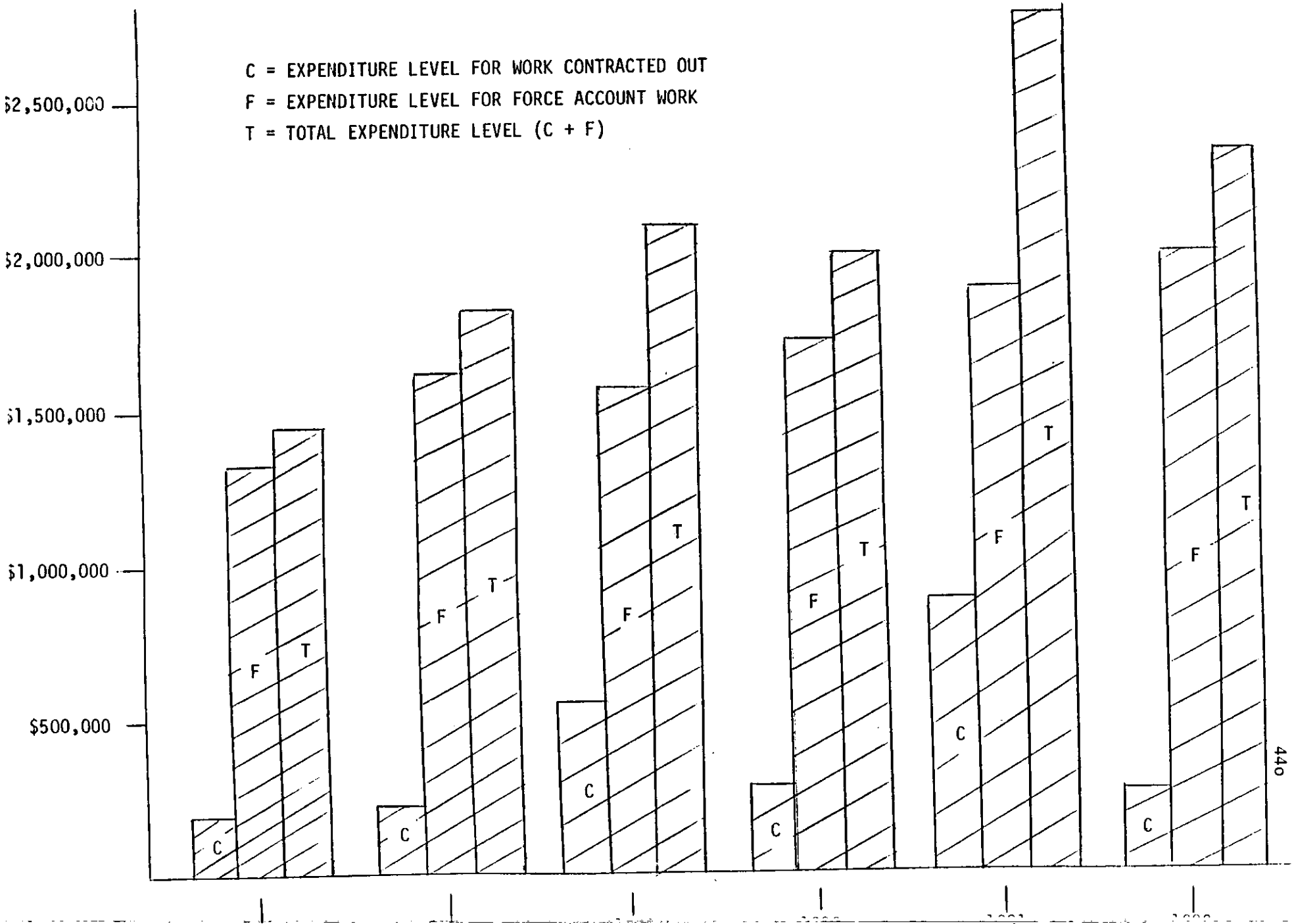
ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCNT OF BUD.
		6,052,196.00	.00	5,919,192.83	133,003.17	FUND TOTALS
	101 TRANSPORTATION FUND					
	1012101 BOARD OF COUNTY COMM					
21015198100	PAYMENTS TO MUNICIPALITIES	71,334.00	.00	71,334.00	.00	.000
		71,334.00	.00	71,334.00	.00	
	1014101 ENGINEERING					
41015413100	PROFESSINAL SERVICES	.00	.00	.00	.00	.000
		.00	.00	.00	.00	
	1014102 ROADS + BRIDGES					
41025411201	SUPERINTENDENT SALARY	30,000.36	.00	30,000.36	.00	.000
41025411202	REGULAR SALARIES + WAGES	880,571.64	.00	863,796.48	16,775.16	1.905
41025412100	SOCIAL SECURITY MATCHING	62,352.99	.00	60,229.86	2,123.13	3.405
41025412200	RETIREMENT CONTRIBUTIONS	103,617.00	.00	98,365.10	5,251.90	5.069
41025412300	LIFE + HEALTH INSURANCE	65,274.00	.00	61,901.07	3,372.93	5.167
41025413100	PROFESSIONAL SERVICES	1,450.00	.00	686.72	763.28	52.640
41025413101	PROFESSIONAL SVCS-SPORTSMAN HARBOR	2,000.00	.00	2,000.00	.00	.000
41025413400	OTHER CONTRACTUAL SERVICES	63,328.00	.00	61,833.60	1,494.40	2.360
41025414000	TRAVEL + PER DIEM	15,650.00	.00	11,816.56	3,833.44	24.495
41025414100	COMMUNICATIONS	934.00	.00	856.88	77.12	8.257
41025414200	TRANSPORTATION	471.34	.00	451.53	19.81	4.203
41025414300	UTILITY SERVICES	83,815.00	.00	67,504.50	16,310.50	19.460
41025414400	RENTALS + LEASES	12,010.33	.00	12,010.33	.00	.000
41025414500	REPAIR + MAINTENANCE SERVICE	212,270.00	.00	206,369.65	5,900.35	2.780
41025414900	OTHER CURRENT CHARGES + OBLIGATIONS	3,793.51	.00	3,347.47	446.04	11.758
41025415100	OFFICE SUPPLIES	1,500.00	.00	1,228.41	271.59	18.106
41025415200	OPERATING SUPPLIES	51,008.88	.00	38,735.64	13,073.24	25.634
41025415300	ROAD MATERIALS + SUPPLIES	231,025.66	.00	217,759.35	13,266.31	5.742
41025415400	BOOKS, PUBLS, SUBS + MEMBERSHIPS	300.00	.00	248.93	51.07	17.023
41025416200	BUILDINGS	19,739.67	.00	18,678.65	1,061.02	5.375
41025416300	IMPROVEMENTS OTHER THAN BUILDINGS	23,530.00	.00	21,871.17	1,658.83	7.050
41025416400	MACHINERY + EQUIPMENT	121,117.50	.00	116,052.39	5,065.11	4.182
		1,986,559.88	.00	1,895,744.65	90,815.23	
	1019990 RESERVES					
99905010000	RESERVE FOR CONTINGENCIES	3,666.00	.00	.00	3,666.00	100.000
99905010001	RESERVE FOR UNCOLLECTIBLE ASPHALT SALES	88,132.12	.00	.00	88,132.12	100.000
		91,798.12	.00	.00	91,798.12	

ACCT. NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCNT OF BUD.
		2,149,692.00	.00	1,967,078.65	182,613.35	FUND TOTALS
	102 TRANSPORTATION TRUST FUND					
	1024102 80% GAS TX POUR OVER FD					
41025413400	OTHER CONTRACTUAL SERVICES	333,450.00	.00	17,445.00	316,005.00	94.768
		333,450.00	.00	17,445.00	316,005.00	
		333,450.00	.00	17,445.00	316,005.00	FUND TOTALS
	111 - FEDERAL REVENUE SHARING FUND					
	1112101 BOARD OF COUNTY COMM					
21015111100	EXECUTIVE SALARIES	22,270.00	.00	22,270.00	.00	.000
21015112100	SOCIAL SECURITY MATCHING	1,492.25	.00	1,492.00	.25	.017
21015112200	RETIREMENT CONTRIBUTIONS	2,434.20	.00	2,434.20	.00	.000
21015112300	LIFE AND HEALTH INSURANCE	85,000.00	.00	81,451.92	3,548.08	4.174
21015112500	UNEMPLOYMENT COMP	6,322.60	.00	6,322.60	.00	.000
21015113100	PROFESSIONAL SERVICES	.00	.00	.00	.00	.000
21015113200	ACCOUNTING AND AUDITING	61,000.00	.00	61,000.00	.00	.000
21015113400	CONTRACTUAL SERVICES	8,476.00	.00	8,476.00	.00	.000
21015114001	TRAVEL PERDIEM IN COUNTY	3,000.00	.00	3,000.00	.00	.000
21015114002	TRAVEL PER DIEM OUT OF COUNTY	257.56	.00	257.56	.00	.000
21015114200	TRANSPORTATION	44.69	.00	15.26	29.43	65.854
21015114500	INSURANCE	204,464.00	.00	203,851.00	613.00	.300
21015114600	REPAIR AND MAINTENANCE	963.30	.00	963.30	.00	.000
21015114900	OTHER CURRENT CHARGES AND OBLIGATIONS	26,902.23	.00	13,441.42	13,460.81	50.036
21015115100	OFFICE SUPPLIES	439.27	.00	392.11	47.16	10.736
21015115200	OPERATING SUPPLIES	115.38	.00	115.38	.00	.000
21015115400	MEMBERSHIPS	1,926.06	.00	1,926.06	.00	.000
		425,107.54	.00	407,408.81	17,698.73	
	1114101 ENGINEERING					
41015411200	REGULAR SALARIES AND WAGES	103,970.93	.00	103,970.93	.00	.000
41015412100	SOCIAL SECURITY MATCHING	6,952.56	.00	6,952.56	.00	.000
41015412200	RETIREMENT CONTRIBUTIONS	11,364.07	.00	11,364.07	.00	.000
41015412300	LIFE + HEALTH INSURANCE	4,793.00	.00	4,387.35	405.65	8.463
41015413100	PROFESSIONAL SERVICES	800.00	.00	800.00	.00	.000
41015413400	CONTRACT SERVICES	.00	.00	.00	.00	.000
41015414000	TRAVEL + PER DIEM	.00	.00	.00	.00	.000

APPROPRIATION AND EXPENDITURE REPORT 10/09/82

ACCT NO.	ACCOUNT DESCRIPTION	BUDGET AMT	ENCUMBRANCES	EXPENDITURES	BALANCE	PERCNT OF BUD.
41015414200	TRANSPORTATION	200.00	.00	158.33	41.67	20.835
41015414400	RENTALS AND LEASES	153.00	.00	133.00	20.00	13.072
41015414600	REPAIR + MAINTENANCE	2,950.00	.00	2,018.66	931.34	31.571
41015414700	PRINTING + BINDING	.00	.00	.00	.00	.000
41015415100	OFFICE SUPPLIES	1,419.99	.00	1,277.46	142.53	10.037
41015415200	OPERATING SUPPLIES	4,541.99	.00	3,528.32	1,013.67	22.318
41015415400	BOOKS, PUBLS, SUBS, AND MEMBERSHIPS	60.00	.00	60.00	.00	.000
41015416400	MACHINERY + EQUIPMENT	339.46	.00	339.46	.00	.000
		137,545.00	.00	134,990.14	2,554.86	
	1114102 ROADS AND BRIDGES					
41025413401	OTHER CONTRACTS GORDON CHAPEL ROAD	42,251.95	.00	42,251.95	.00	.000
41025413402	OTHER CONTRACTS POINT OF WOODS	9,621.71	.00	9,621.71	.00	.000
41025414700	PRINTING + BINDING	740.00	.00	731.33	8.67	1.172
41025415200	OPERATING SUPPLIES	221,663.09	.00	220,781.76	881.29	.398
		274,276.71	.00	273,386.75	889.96	
	1119101 TRANSFERS					
91015819100	TRSFR TO NURSING HOME AUTHORITY	36,000.00	.00	36,000.00	.00	.000
91015819101	TRSFR TO GROUP INSURANCE RESERVE	21,688.31	.00	20,000.00	1,688.31	7.784
		57,688.31	.00	56,000.00	1,688.31	
	1119990 RESERVES					
99905010000	RESERVE FOR NURSING HOME AUTHORITY	.00	.00	.00	.00	.000
99905010001	RESERVE FOR CONTINGENCIES	1,382.44	.00	.00	1,382.44	100.000
		1,382.44	.00	.00	1,382.44	
		896,000.00	.00	871,785.70	24,214.30	FUND TOTALS
	114 FISHING IMPROVEMENT FUND					
	1146305 FISHING IMPROVEMENT					
63055371200	REGULAR SALARIES AND WAGES	.00	.00	.00	.00	.000
63055371300	OTHER SALARIES AND WAGES	.00	.00	.00	.00	.000
63055372100	SOCIAL SECURITY MATCHING	.00	.00	.00	.00	.000
63055372200	RETIREMENT CONTRIBUTIONS	.00	.00	.00	.00	.000
63055372300	LIFE AND HEALTH INSURANCE	.00	.00	.00	.00	.000
63055373400	OTHER CONTRACTUAL SERVICES	15,500.00	.00	460.00	15,040.00	97.032
63055374000	TRAVEL AND PER DIEM	2,000.00	.00	1,915.46	84.54	4.227

APPENDIX II-C



APPENDIX II-D

Computerization Facilitates County Road Management

TOM SPOONTS
Transportation Administrator,
Travis County,
Austin, Texas

TRAVIS County, Texas is urbanizing rapidly. The county has an area of 1,040 square miles surrounding the capital city of Austin and a population of 416,315. The expanding county road system currently consists of about 1,500 miles.

Soon after he joined the county in 1975 as traffic engineer, David B. Preble, P.E., realized that a modern method of keeping road records was needed. Two employees of the engineering department, transportation analyst Joe Gieselman and the author, accepted the challenge of studying the existing record system (much of which was never documented) and putting together a system that was completely documented, accurate, readily accessible, expandable (for maintenance input), and available in some form to various precinct staffs as well as county engineering personnel.

Existing records were studied for accuracy and updated. This entailed putting all available recorded information into one master file. In-depth field studies were then started. Every mile of the country road system was driven and the following information logged: number and type of drainage structures, existing official signing, road length, traffic striping (existing and needed), right-of-way width and pavement width, type of roadway base, and type of roadway surface.

Each road was assigned a distinct six-digit number which identified its location in the county by road atlas sheet number. Travis County has an atlas containing 154 sheets of 1" to 1,000' scale drawings which map the entire county.

The average daily traffic figure was obtained from state highway department files and put into the master file. As this list of information grew, it became apparent that other related information such as the following would be useful:

- Sheriff's patrol district in which each roadway exists.
- Location of roadways with urban type concrete curbs.
- Legal status of the road — private or public.
- How the right-of-way was acquired.
- Change in amount of traffic over the last six years.
- Condition of bridges and other drainage structures.
- Whether or not the roadway has officially been accepted for maintenance by the county.

After analyzing the quantity of information desired to be recorded, it was decided to go with a computer record system. As Travis County already had a computer system at its courthouse complex, the only requirement was the installation of video terminals in the county engineering department and the development of computer programs (software) to process the road records. The cost of two video terminals was $4,000 each with a yearly maintenance contract of $350 each. In addition to providing access to the computer road and maintenance data programs, the terminals can also be used for other engineering functions.

The computer software for the road record system was developed by Travis County data processing center staff programmers and given the name "County Engineers System."

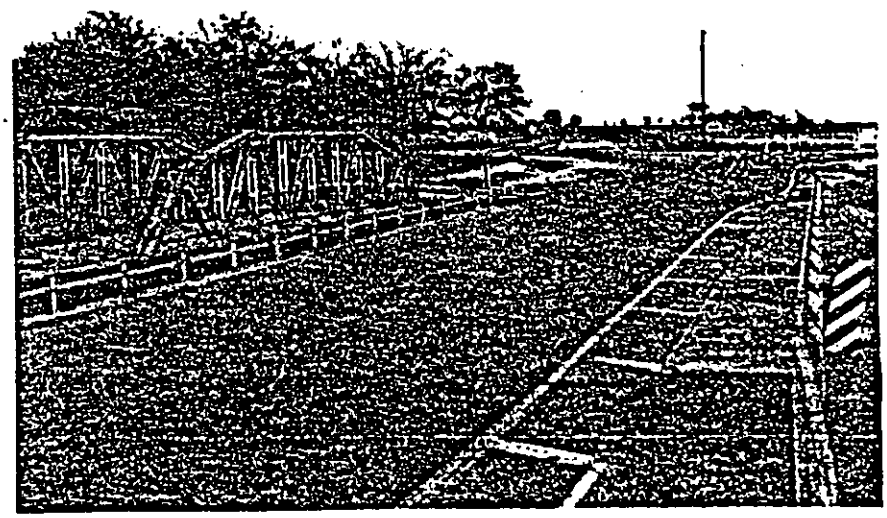
One very unique feature was incorporated into the system whereby not only the exact road name is pulled up on the video terminal for display, but roads with duplicate names and names which are of similar spelling or sound alike are also retrieved. There are four basic information programs used currently in the system.

Find Road Number by Name Search. All road information is stored under the unique number for each road. If that road number is not known, it can be found by the use of this program. The road name is typed into the terminal Once this inquiry is entered, the terminal will display all similarly sounding names, all similarly spelled names, and all duplicate names of roads along with their precinct numbers, subdivision names (if any), and their distinct road numbers, which can then be entered to get additional information by one of the three remaining program options.

■ **FIGURE 1. Program display for finding road number by name search.**

```
10/08/81              C E S FIND RECORD BY NAME SEARCH                CESSC101
        ENTERED ROAD NAME NORTH DESSAU RD              PRECINCT 0
ROAD NUMBER   ROAD NAME                    + PCT SUBDIVISION
  H07221      NORTH PEAK ROAD              + 3   TIMBERLINE TERRACE
  005201      NORTH PLACE                    2   GREGG POINT
  003501      NORTH PENINSULAR DRIVE         2   SINGLETON BEND
  M09607      NORTH BEND DRIVE               2   NORTH PARK ESTATES
  P05735      NORTH PARK DRIVE               2   LAKE SANDY RETIREMENT VIL
  L09207      NORTH OAKS DRIVE               2   NORTH OAKS
  005601      NORTH STREET                   2   LAKE TRAVIS
  N08904      NORTH SHIELDS DRIVE            2   NORTH SHIELDS
  E07104      NORTH CHISHOLM LANE            3
  J07212      NORTH OAK CANYON ROAD          3   WESTLAKE HIGHLANDS
  L04816      NORTE COURT                    3   LAKEWAY
  M10000      NORTH DESSAU ROAD              2
  P05700      NORTH LAKEVIEW DRIVE           2   JONESTOWN HILLS
  J10102      NORTHLAKE DRIVE                1   H R SMITH ADDITION
  K05708      NORTH LAKELAND DRIVE           2   LAKELAND PARK
  L04828      NORTH EL DORADO                3   LAKEWAY
  F09600      NORWOOD LANE                   4   BLUE BONNET GARDENS
  F10900      NORWOOD LANE                   4
     A PLUS INDICATES THIS IS AN ADDITIONAL NAME FOR SOME OTHER ROAD NAME
          ENTER 888 TO DISPLAY MORE NAMES
          ENTER ROAD NUMBER M10000  NEXT OPTION 005  (*)
```

■ **BRIDGE replacement project on North Dessau Road, subject of the displays.**



This program lets the operator see a range of similar names with pertinent information so that he can be sure the name typed in is the exact one he is looking for. See Figure 1 for this search program display.

Display General Road Record. This program must be called up by its distinct road number. If that is not known, it can be found by using the previous option "find road number by name search." Information displayed by the general road record on the video terminal is as follows:

1. Road number.
2. Road length in miles (to the nearest hundredth).
3. Other names by which the road is referred to.
4. Precinct number where road starts.
5. Tax map number (which is also our aerial photograph number).
6. City of Austin grid map number.
7. Sheriff's patrol district number (for locating fire, police, and ambulance emergencies).
8. Description of the beginning and ending locations.
9. Right-of-way widths (three figures: minimum, maximum, and mode).
10. Road condition number (composite number from 1 to 100 for comparison with other roads in the same precinct.)
11. Subdivision name (if road is in a subdivision).
12. Number of bridges.
13. Pavement types, curb types, and surface widths (for up to five mileage segments).
14. Legal status of road.
15. City or village (if road starts there and runs into county).
16. Whether or not road is accepted by county for maintenance and what type of maintenance (for up to five mileage segments).
17. Plat record book and page number for up to four parcels of deed or dedication.

See Figure 2 for display of this general record.

Display Maintenance History Record. Up to 100 different maintenance operations can be coded into the record for individual mileage segments of roadway when maintenance work is done. This program displays the last ten records of maintenance work done on the road. A simple coding system describing the type of maintenance was devised to be kept by the precinct offices so that regular updating of maintenance records on the computer would be done easily. A maintenance history record is shown in Figure 3.

Display Traffic Record. This program displays up to five traffic counts by date and mileage segment along a road. This information, along with information from another computer system program, stores traffic accident data, and has helped satisfy requirements for acquiring federal matching funds for making roadway safety improvements.

FIGURE 2. Display of general road record for North Dessau Road.

```
02/08/82                  C E S  DISPLAY GENERAL ROAD RECORD            CESSC120
ROAD NUMBER M10000  PCT 2    TAX MAP 25931  AUSTIN GRID MN32 PATROL DISTRICT 214
ROAD NAME 1 NORTH DESSAU ROAD                * BEG LOG M10700N        END LOG N10600
ROAD NAME 2 DESSAU-PFLUGERVILLE ROAD         + ROW MIN 060   ROW MAX 060   MODE 060
ROAD NAME 3                                    END MPT 02.92     ROAD CONDITION 007
SUBDIVISION NAME                                        # BRIDGES 01
                PAVE/CURB/WIDTH   BEG MPT  END MPT
                   5    0   20     00.00    01.80
S U R F A C E      7    0   22     01.80    02.17
   T Y P E         7    0   40     02.17    02.45
                   7    0   28     02.45    02.80
                   7    0   34     02.80    02.92

               LEGAL/JURIS/ACCEPT BEG MPT  END MPT
                   2    1    2     00.00    02.92
    R O A D        0    0    0     00.00    00.00
S T A T U S        0    0    0     00.00    00.00
                   0    0    0     00.00    00.00

                 BOOK/PAGE    BOOK/PAGE
     P L A T     0371 0405    0365 0593
 R E C O R D S   0367 0029    0367 0272
                                               U P D A T E ? X (Y, N OR D)
                ENTER ROAD NUMBER  X     NEXT OPTION 000  (*)
```

FIGURE 3. Maintenance history record for North Dessau Road.

```
02/08/82                 C E S  ADD/CHANGE MAINTENANCE HISTORY RECORD      CESSC130
ROAD NUMBER M10000    PRECINCT                          SUBDIVISION
ROAD NAME 1                    2
          3
                                 10 MOST CURRENT RECORDS
            C OR D      TYPE DATE     BEG MPT    END MPT          SEQ NO.

 C=CHANGE               10   0679     02.17      02.45            001
 D=DELETE      X        54   0779     01.80      02.17            002
               X        10   0779     02.45      02.92            003
               X        40   0879     01.80      02.17            004
               X        40   0879     02.17      02.45            005
               X        40   0879     02.45      02.92            006
               X        57   1079     02.45      02.92            007
               X        21   1179     01.80      02.17            008
               X        21   1179     02.17      02.45            009
               X        21   1179     02.45      02.92            010

            ADD NEW     00   0000     00.00      00.00            000
            ADD NEW     00   0000     00.00      00.00            000
            ADD NEW     00   0000     00.00      00.00            000

                                                U P D A T E ? X (Y OR N)
               ENTER ROAD NUMBER X        NEXT OPTION 000  (*)
```

Use of the Automated System

Engineering personnel use the system to find various items of stored data. The real time-saver, however, is that the engineering department clerks or engineering secretary can answer telephone inquiries concerning roads and give out accurate information from the video terminal without having to transfer the call to one of the staff engineers. This saves the engineers' time, keeps the person making the inquiry from having to restate his needs a second time on the telephone, and gives the inquirer a fast and accurate answer to his questions.

In addition to the use of the video terminals in the engineering office, two computer hard copy printouts are made and combined into a booklet that gives a cross-index of road names and road numbers. One listing is an alphabetical listing of street names, the other is a numerical listing of street numbers. This cross-index can be used in place of the "find road number by search" program as the road name can be rapidly looked up alphabetically in the booklet to find the road number, which can then be entered into the proper computer program to show the desired information.

The cross-index booklet is printed with columns of other information that are pertinent to precinct office personnel. This allows the booklet to be used both as a source of information in offices lacking a video terminal, and as a cross-index for video terminal users.

Hard copy printouts of the complete road record file can be printed for checking and updating information. One copy of this printout, sorted to contain only the roads in each of the four county precincts, is presented to each precinct commissioner for his or her use.

Part of the cost for conducting the survey to gather information for this system was funded through a Metropolitan Planning Grant from the Federal Highway Administration. □□□

APPENDIX II-E

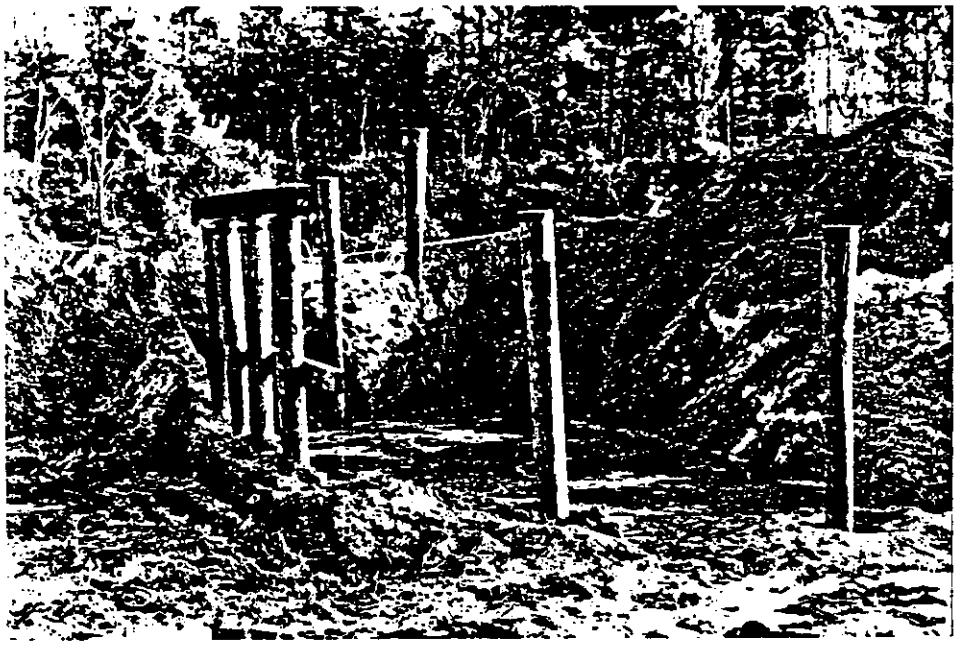
Photographs from "Day-on-the-Job" Study

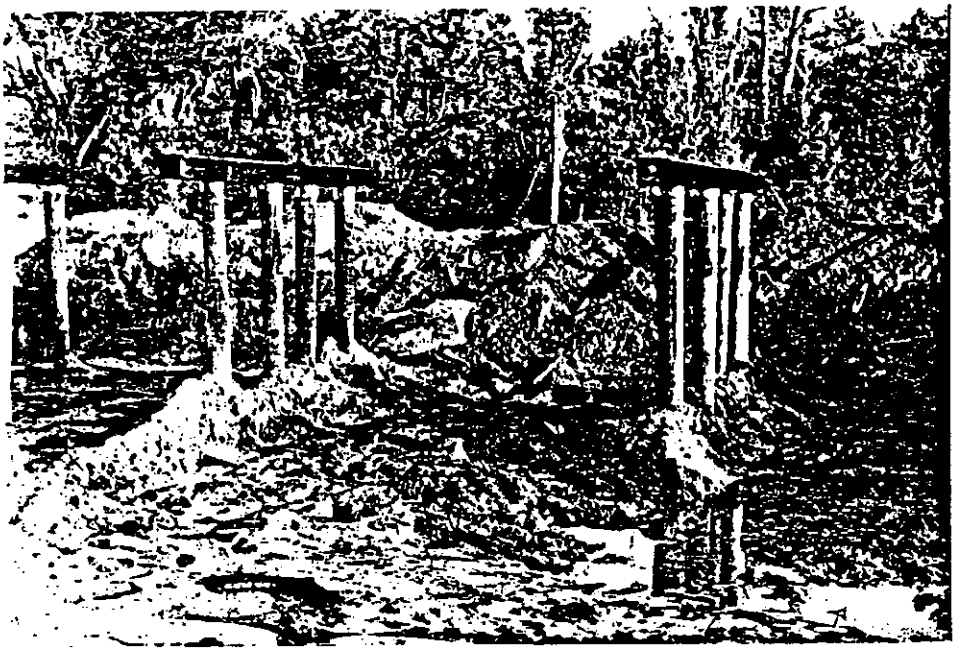
EAST END

7:30 a.m.

7/21/83

1





2

CENTER TWO SUPPORTS

7:30 a.m.

7/21/83

WEST END

7:30 a.m.

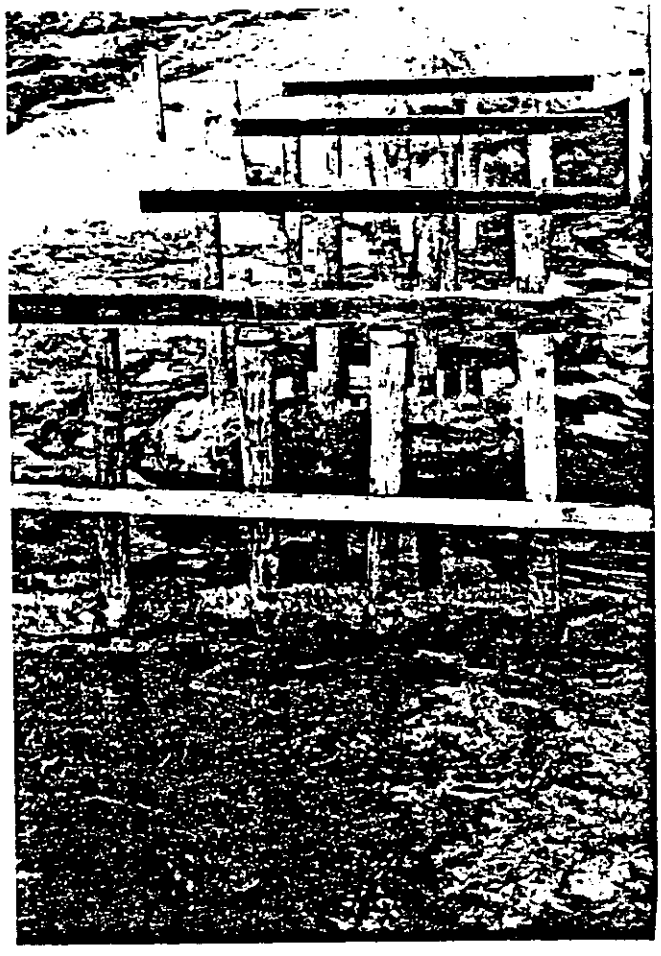
7/21/83

3

4

4
B

5



6

Upper left: SOUTHWEST CORNER

7:30 a.m.

7/21/83

Upper right: NORTHWEST CORNER

7:30 a.m.

7/21/83

Lower right: TOP EAST END

7:30 a.m.

7/21/83

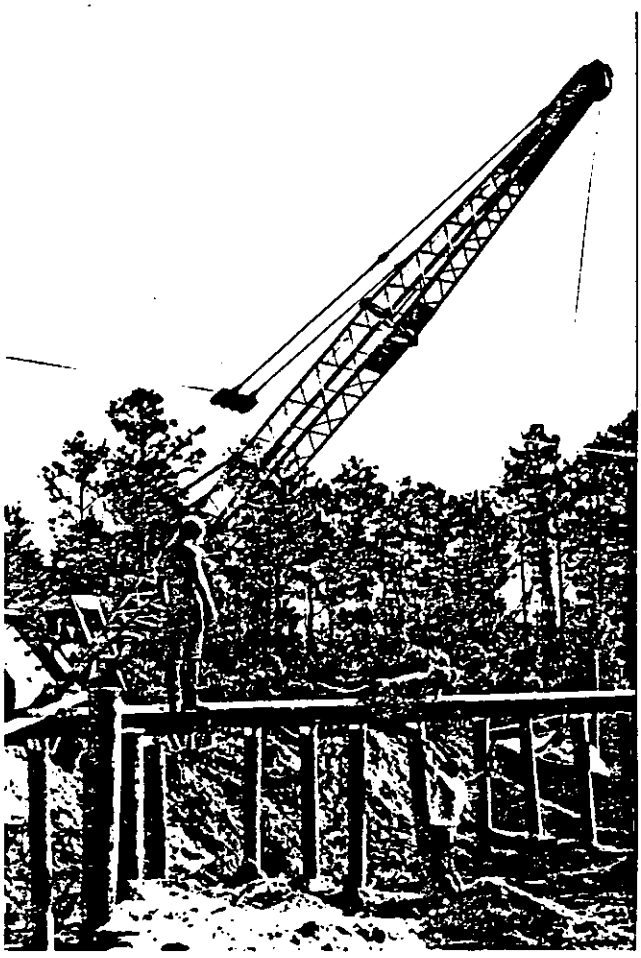
TEMPORARY CULVERT

WEST END

7:30 a.m.

7/21/83

7

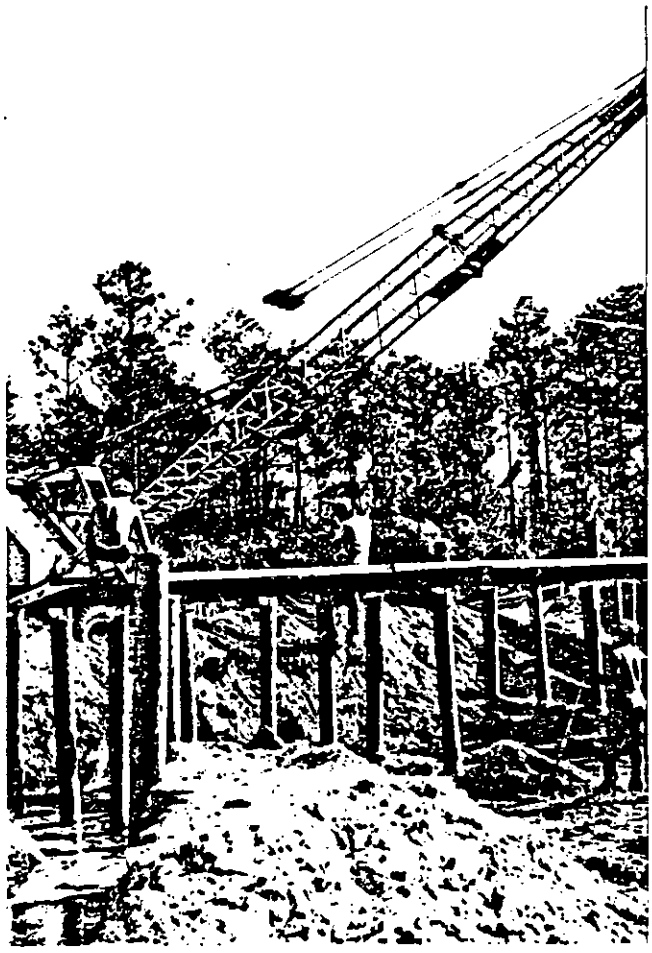


STRAIGHTENING PILE

8

9:35 a.m.

7/21/83

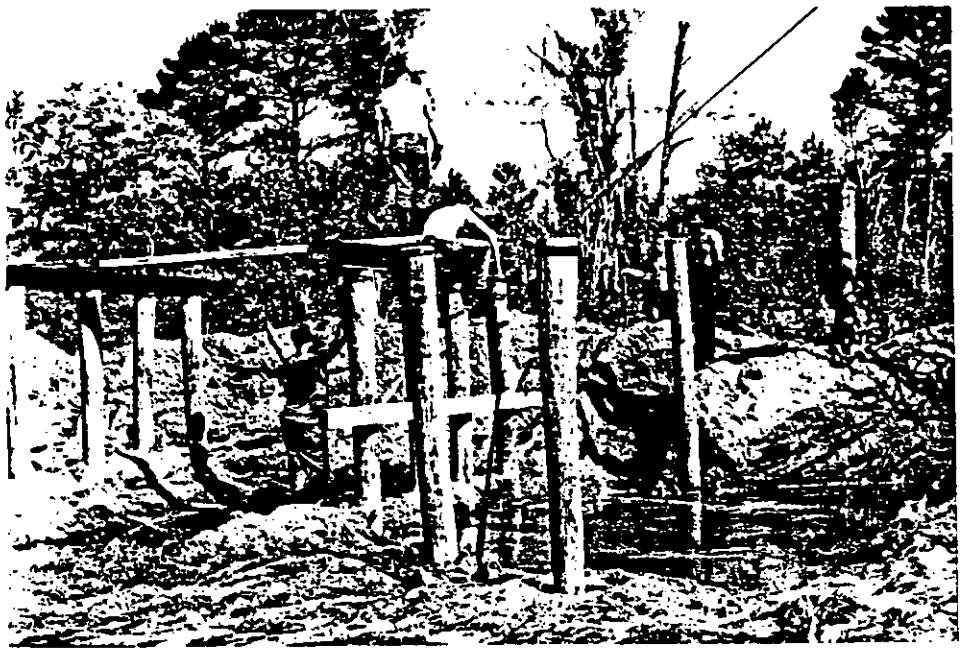


SPIKING THE PILE CAP

9

9:40 a.m.

7/21/83

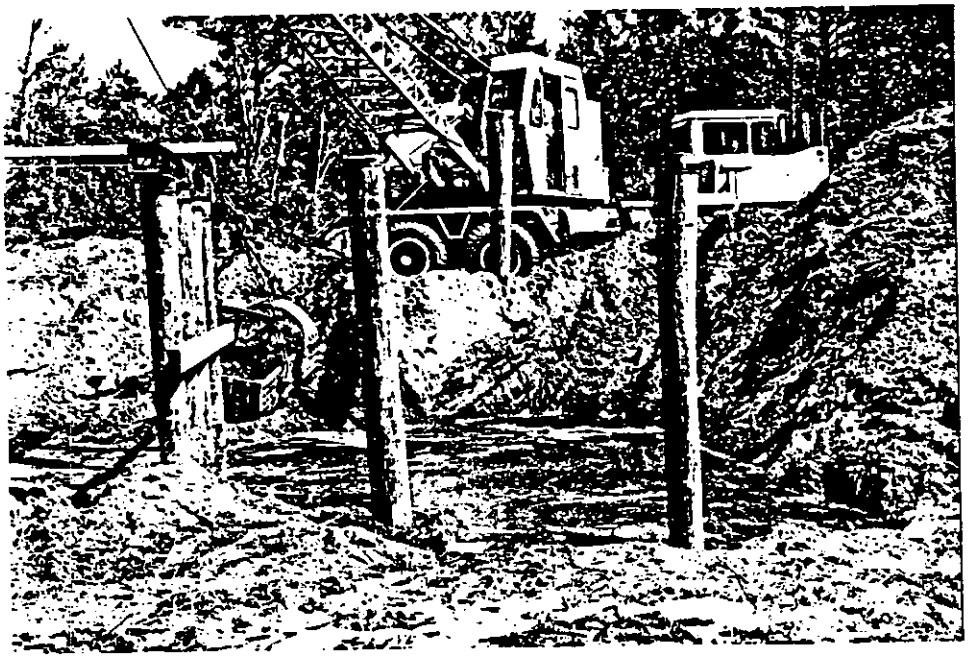


ALLIGNING THE PILES

10:07 a.m.

7/21/83

10



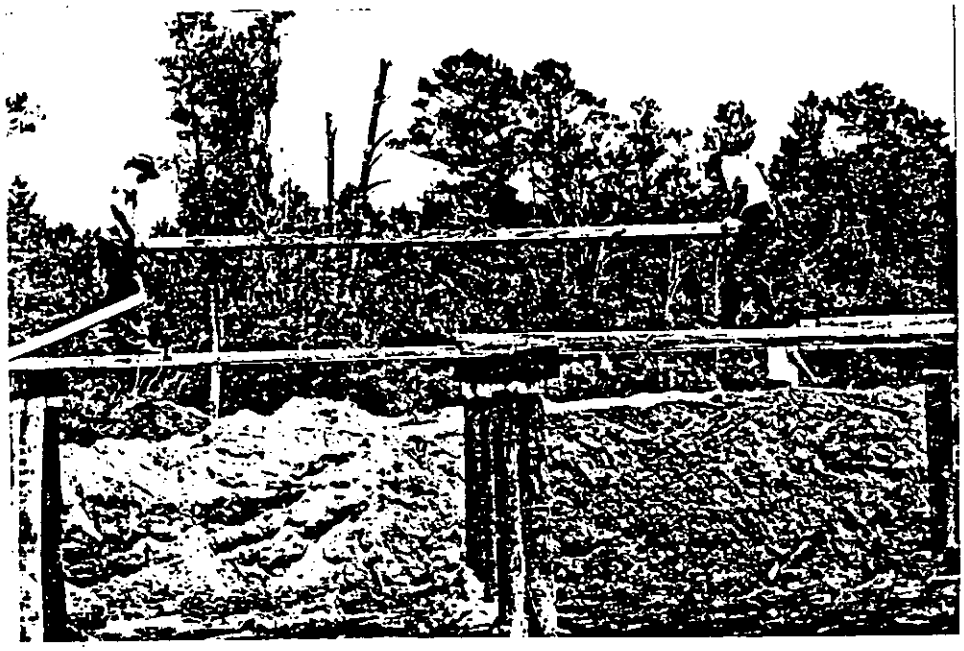
11

TURNING BANK THE

TEMPORARY ROAD BANK

10:37 a.m.

7/21/83



SETTING OUT THE

STRINGERS

11:34 a.m.

7/21/83

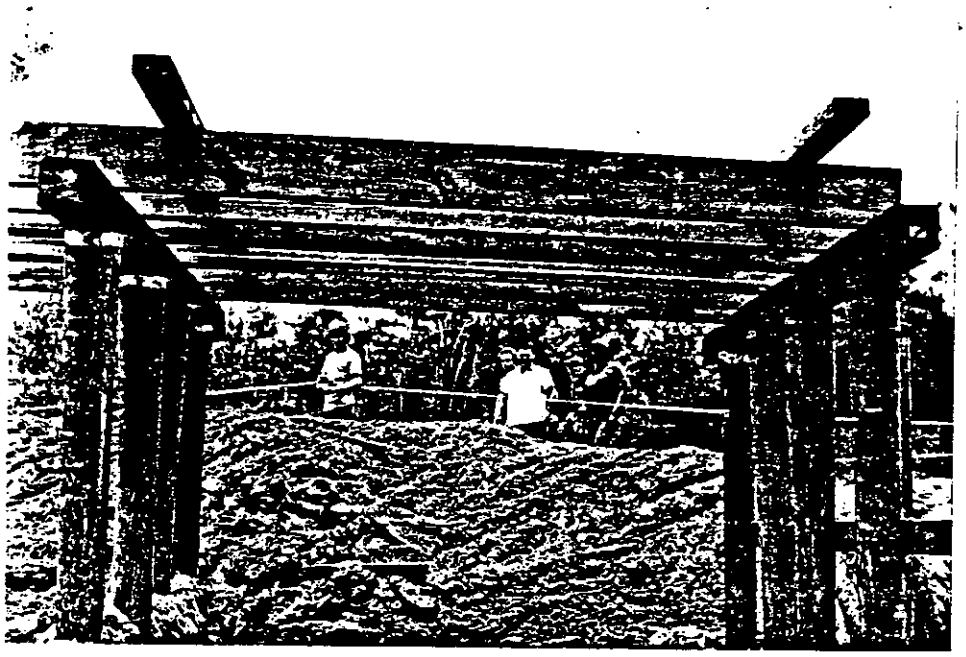
12

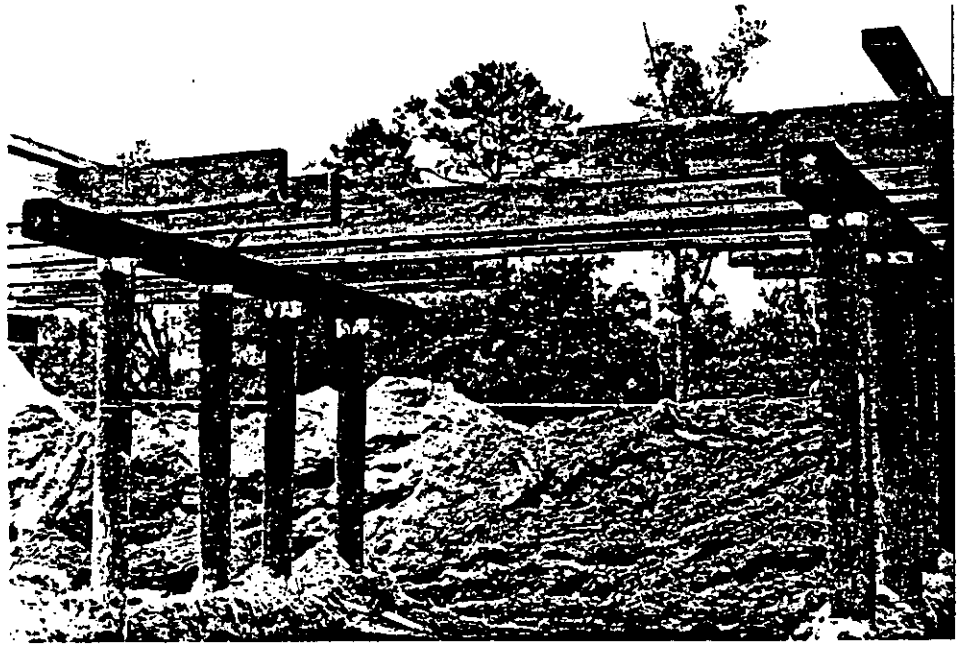
EAST END

End of day

7/21/83

13





CENTER TWO SUPPORTS

End of day

7/21/83

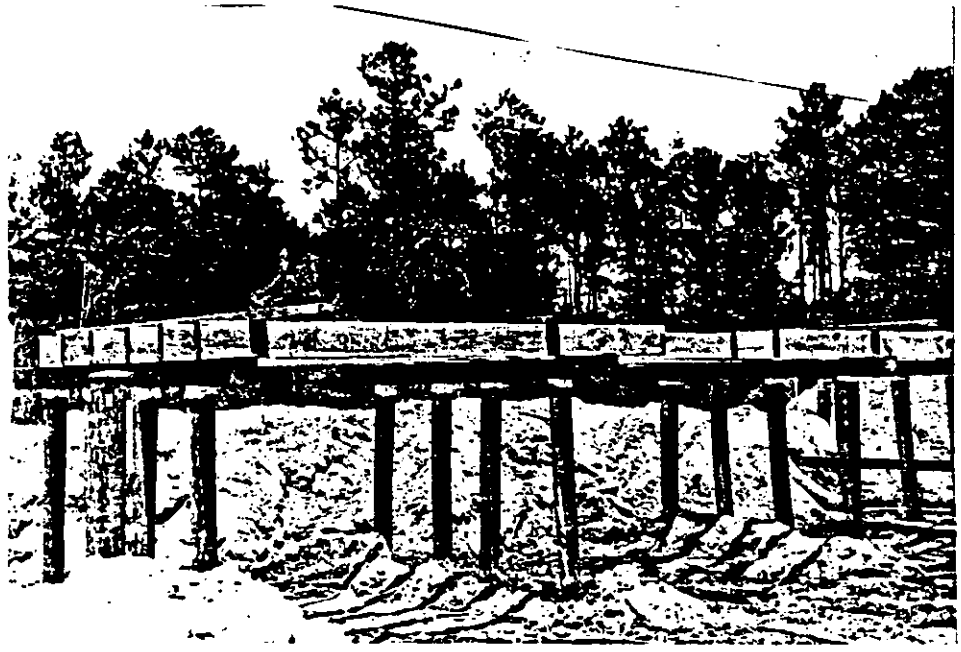
14

WEST END

End of day

7/21/83

15



NORTHWEST CORNER

End of day

7/21/83

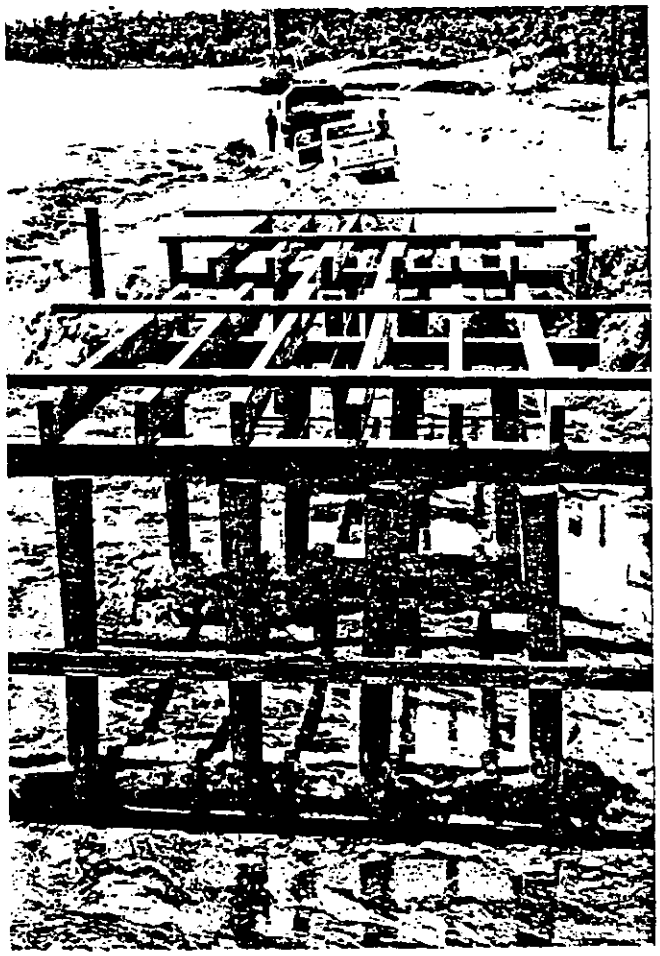
17

SOUTHWEST CORNER

16

End of day

7/21/83



TOP EAST END

18

End of day

7/21/83

APPENDIX II-F

Analysis of Bannerville Bridge Project

BANNERVILLE BRIDGE PROJECT
PUTNAM COUNTY, FLORIDA
JUNE - JULY 1983

What cost reporting that is done by the Putnam County Public Works Department originates with the 'Equipment Use report' sheets as shown in figure A. These two reports are typical of the reports turned in on the rest of the Bannerville Bridge Project. For equipment they show identification, fuel and lubricants necessary, speedometer or hour meter readings, a general description of the type indicated and approval initials of Supervisor. Labor, other than equipment operators, is shown on the Equipment Use Report for the 'labor truck'. This report includes the date, truck identification, lubricants, etc., speedometer reading, description of hauling activity followed by hours worked, crew foreman signature with work time, and the approval initials of the Supervisor.

With this being the source documentation for job costs, it is apparent that no breakdown of costs identifiable with specific job activities is possible. From the 'Equipment Use Reports' for the Bannerville Bridge only the roughest of cost comparison figures can be determined. The following were the only work activities for which cost comparison figures have been attempted.

1. Removal of old culvert, reexcavation, replacement with new 24" culvert, backfill and regrading of road. June 1, 1983.
2. Driving the 20' long piles. July 12, 13, 14, and 18.
3. Alligning piles and attaching pile caps, setting stringers. July 21, the date of the 'day on the job study'.

CULVERT COST ANALYSIS

The June 1 Equipment Use Reports show the Little Giant, a D-7 Dozier, a Lo Boy for delivery of equipment, and the Labor truck with four laborers and a foreman on the job site for "ditch clearing, pushing out old culvert, putting in a new 24" culvert 40' long, and fixing road back over it."

The Labor and Equipment summaries in this Appendix show totals for direct job costs exclusive of supervisor of $408.02 and $1,507 respectively.

The direct cost total for this day's work is $1,915. The culvert installed is shown in photograph in Appendix IIE. Walker's Building Estimator's Reference Book (21st Edition) was referred to in the development of the following analysis:

QUANTITIES:

Excavation: (6'+ 3') - 2 x 3'h x 40'l - 27 = 20 cy
Backfill: 20 cy also; ignored culvert volume trim bottom of ditch: 3'w x 40'l = 120 sf
Culvert: 40lf, 24"ϕ

ESTIMATED COSTS:

		QTY	L.UP	EQ UP	LABOR	EQUIP
	SET UP AND DELIVERY:					
	Labor Truck	1 day	----	27.00	-----	27.00
	Travel Time (5 man crew)	1.5 hr	28.68	-----	43.02	-----
	LoBoy & Driver	5.33 hr	5.99	40.00	31.91	213.00
	EXCAVATION:					
(1)	Dragline & Operator	1.07 hr	7.26	64.00	7.77	68.00
	INSTALLATION:					
(2)	Trim bottom (5 man crew)	1 hr	28.68	-----	28.68	-----
	Place Culvert (crew)	.75 hr	28.68	-----	21.51	-----
	Dragline (crane) with operator	.75 hr	7.26	64.00	5.45	48.00
	BACKFILL:					
	Dozier with operator	1 hr	9.44	116.00	9.44	116.00
(3)	CLEARING DITCH LINES:					
	Dragline with operator	6.93 hr	7.26	64.00	55.76	396.00
	Dozier with operator	5.5 hr	9.44	116.00	51.92	639.00

BRIDGE FRAMING COST COMPARISON - (the day on the job)

On July 21st, work done by laborers, foreman, and supervisor is listed below as work categories;

Attach pilecaps ..... 2 3/4 ea.
Layout for stringers ..... 18 ea.
Set stringers ..... 14 ea.
Temporary Bracing Boards .. 4 ea.
Set warning flagging .....

The Little Giant was on the jobsite and assisted in alligning the piles and hoisting stringers out onto the bridge supports. It also was used to dig back earth from the bridge area. A full description of the activities on the jobsite this day can be found on pages 33 through 39 of this report. The total cost for this day was $539 for the equipment and $263.04 for labor giving a total of $802.04.

The costs below are estimated derived from Walker's Building Estimator's Reference book, 21st Edition:

QUANTITIES:

Stringers: 14 x 4 x 16' = 896 BF

ESTIMATED COSTS:

	QTY	L.UP	EQ UP	LABOR	EQUIP
SUPPORT EQUIPMENT:					
Crane	1 day	75.52	512.00	75.52	512.00
Labor Truck	1 day	------	27.00	------	27.00
(1) ATTACH PILECAPS:	2 3/4 ea	14.74	------	40.54	------
(2) LAYOUT for stringers:	L.S.	13.16	------	13.16	------
(3) SET STRINGERS:	896 BF	.075	------	67.56	------
TEMP BRACING BOARDS:	4 ea	3.00	------	12.00	------
FLAGGING:	L.S.	5.00	------	5.00	------
TOTALS				213.78	539.00

TOTAL LABOR	$214.00
TOTAL EQUIPMENT	539.00
TOTAL ESTIMATED COSTS	$753.00

Notes: (1) 30 minutes per pilecap for crew of one foreman and four helpers with crane assistance; $14.74 / pilecap.
(2) Layout consisted of marking and stringlining centerline of bridge and marking spacing for 6 joists on each of the 4 supporting pilecaps. (See photo #18) used foreman and helper for one hour for this operaion 7.72 + 5.44 = 13.16).
(3) Walker's Building Estimators Reference Book, page 651, indicates that when placing wood joists, 4 x 12 or 4 x 16 in size, where the joists sit on top of wood girders ... Labor cost per 1,000 feet is 7.3 carpenter and 3.5 hours laborer:
using 7.3 x 7.72 + 3.5 x 5.44 = 75.40 /mbm or $.075 / BF.

TOTALS	255.46	1507.00

TOTAL LABOR	255.00
TOTAL EQUIPMENT	1507.00
TOTAL ESTIMATED COSTS	$1762.00

NOTES: (1) Walker's page 143; 25% efficiency used in common earth giving productivity of 18.75 cy per hour.
(2) Walker's page 170; Grading for footing bottoms (similar); 4 man hours per 100 sf = 120 sf in .96 hr for 5 man crew.
(3) The entire balance of Dozier and Dragline costs were included here. The quantity of work for analysis of productivity was undeterminable.

PILE COST ANALYSIS:

The piles used for the bridge were 16 feet long with approximately 8 feet into the ground and 8 feet exposed. The tops were protected with wire wrapping during driving and were cut off to final elevation after driven. The direct cost in this comparison is all labor and equipment shown on the reports from July 12 when the first piles were driven, through July 18th when the last piles were driven, plus the laborers, foreman and labor truck expense for July 19th and 20th which is for bracing, caping and placing of pile caps as photographs 1-6 in Appendix IIE.

The Labor and Equipment Summaries show direct costs as set forth above for these days as $1,591.28 and $2,579 respectively for a total of $4,170. Walker's and common sense indicate costs as shown below:

Complete job set-up and dismantling are not considered in this analysis because the Little Giant was already on the jobsite for other uses and remained on the jobsite after the piles were driven. Only the change in rigging for the Little Giant is considered.

ESTIMATED COSTS:

	QTY	L.UP	EQ UP	LABOR	EQUIP
PILE DELIVERY, LAYOUT & SETUP:	1 day	229.44	235.00	229.44	235.00
EQUIPMENT RIGGING:	1 day	75.52	512.00	75.52	512.00
(1) DRIVE PILES: (24 ea.)					
Equipment operator	1 day	75.52	512.00	75.52	512.00
Driver Crew (5 man)	1 day	229.44	27.00	229.44	27.00
(2) CUT OFF PILE TOPS:	16 ea	2.40	———	38.40	———
(3) CAP PILES WITH METAL:	13 ea	2.62	———	34.06	———
LABOR TRUCK:	1 day	———	27.00	———	27.00
(4) PLACE PILE CAPS:	1.25ea	57.36	———	71.70	———
BRACE PILE SET #4: (5 man crew)	.5 hr	28.68	———	14.34	———
TOTALS				768.42	1313.00

TOTAL LABOR	$ 768.00
TOTAL EQUIPMENT	1313.00
TOTAL ESTIMATED COSTS	$2081.00

Notes:
(1) Walker's Building Estimating Reference Book, page 180, gives a pile driving rate for 24' long foundation piles of 36 per day. Walker's uses a large pile driver but we have shorter piles. A rate of 24 per day seems reasonable.
(2) Walker's Building Estimating Reference Book, page 180, shows 12" to 14" piles cut off at a productivity rate of .22 labor hours per top. (.22 x $5.24) = $1.20 ea, adjusted for 50% efficiency the unit cost is $2.40 ea.
(3) Using a laborer for 30 minutes per pile.
(4) Placing pilecaps using crane (cost not included) with labor crew (5 man) alligning and spiking down @ 2 hours per 8" x 8" pilecap gives $57.36 / pilecap.

APPENDIX II-G

FIGURE A

Crane Equipment Use Report - July 20, 1983
Bannerville Bridge

EQUIPMENT USE REPORT

Date 7/20/1983

Equip. No. 48 Equip. Type Littlegant

Gas _____ Diesel _____ Oil _____ Grease _____

Trans. _____ Hyd Fld _____ Tires _____ Other _____

Speedometer Reading: Hour Meter Reading:

Start _____ Finish _____ Start _____ Finish _____

Miles _____ Hours _____

MATERIAL	FROM	TO	NO. LOADS

Work Kind Digging Dirt and Returning Dist. No. _____

Location Pattern on Bannerville Bridge

Road Name Road Time 7:00 - 3:30

with Littlegant

Delay Hours _____ Cause (Describe) _____

Operator Roscoe Wakeberg Approved By _____

Time In 7:00 Time Out 3:30

Supervisor

PCRD-56

Day on the Job Labor Report on an Equipment Use Report - July 21, 1983
Bannerville Bridge

EQUIPMENT USE REPORT

Date 7-21-83

Equip. No. 1032 Equip. Type Labor truck

Gas _____ Diesel _____ Oil _____ Grease _____

Trans. _____ Hyd Fld _____ Tires _____ Other _____

Speedometer Reading: Start 79359 Finish 79398 Hour Meter Reading: Start _____ Finish _____

Miles _____ Hours _____

MATERIAL	FROM	TO	NO. LOADS

Work Kind Fix Bridge Dist. No. 4/

Location _____

Road Name Clean office 7:00 to 7:30 Time

Fix Bridge on Bannerville Rd

7:30 to 3:00

T. Blanc 8 hrs 1/2

J. Clayton 8 hrs. 1/2

S. Gibson 8 hrs. 1/2

Delay Hours _____ Cause (Describe) _____

Operator A. Mall

Time In 7:00 Time Out 3:30

Approved By _____

Supervisor

PCRD-56

EQUIPMENT SUMMARY

BANNERVILLE BRIDGE PROJECT
PUTNAM COUNTY PUBLIC WORKS DEPARTMENT (37)
JUNE-JULY 1983

DATE		DESCRIPTION OF ACTIVITY	1 LITTLE GIANT #48, #160	2 D-7 DOZIER #77	3 FRONT END LOADER #72	4 12cy DUMP TRUCK	5 KOEHRING DRAGLINE #97	6 GRADER #129	7 LO-BOY #1034	8 LABOR TRUCK #22, #1032	9	10
JUNE	1	EXCAVATE, INSTALL CULVERT, BACKFILL	$ 512	$ 755					$ 213	$ 27		
	2	CUT DITCH, PUSH SAND		930								
	8	CLEAR TEMP ACCESS		291								
	13	EXCAVATION	384						80			
	14	DEMUCK	512		$ 380				107			
	15	MOVE DIRT	512		380							
	16	DEMUCK / MOVE DIRT	512		380							
	17	DEMUCK / MOVE DIRT	512		380							
	20	DEMUCK / MOVE DIRT	512		380							
	21	MOVE DIRT			380							
	22	DEMUCK / MOVE DIRT	512		380							
	23	FILL ROAD, HAUL IN FILL			MR 380	$ 235						
	24	GRADE ROADWAY		1164*				$ 287*				
	27	DEMUCK/CLEAN CANAL/MOVE DIRT	512		380		$ 511*			18*		
	28	DEMUCK / MOVE DIRT	512		380							
	29	EXC. FOR ROAD FILL / MOVE DIRT / DITCH	512	930	380							
	30	DEMUCK / HAUL EXCESS / MOVE DIRT	512	930	380	944*						
JULY	1	EXC. & FILL ROADWAY & RAMP	512	930		470						
	5	FILL RAMPS / MOVE DIRT / HAUL EXCESS		930	560	606*			107			
	6	FILL DITCH / MOVE DIRT		930		470				27		
	7	FILL DITCH / SET UP PILE DRIVER	512	430								
	8	FILL WASHOUT / SET UP PILE DRIVER	512	581*		1916*						
	11	MOVE DIRT		291*								
	12	DRIVE 4 PILES	512			MR 236R						
	13	DRIVE 8 PILES	512			1616*				27		
	14	DRIVE 4 PILES	512							27		
	16									27		
	18	DRIVE 8 PILES	512							27		
	19	EXCAVATE UNDER BRIDGE	512							MR 27		
	20	EXCAVATE UNDER BRIDGE	518							27		
	21	ALIGN PILES / [illegible]	512 ①							104*		
	25									27		
	27									27		
	28									27		
	29											
		TOTALS	$ 11136	$ 8544	$ 4[illegible]	$ 2[illegible]	$ 511	$ 287	$ 507	$ 325		
		GRAND TOTAL									$ 28712 00	

* - PRORATED , MR - 8 HRS. MAXIMUM RATE

① - EQUIPMENT REPORT WAS NOT WITH THE INFORMATION RECEIVED FROM PUBLIC WORKS, BUT THIS WAS THE DAY OF THE ON-SITE STUDY; SEE PGS 38-39 AND APPENDIX II C FOR PHOTOGRAPHIC

BANNERVILLE BRIDGE PROJECT
PUTNAM COUNTY PUBLIC WORKS DEPARTMENT
JUNE - JULY 1983

LABOR SUMMARY

DATE 1983		DESCRIPTION OF ACTIVITY	1 LABOR	2 FOREMAN	3 MOTOR VEHICLE OPERATOR II	4 LIGHT EQUIPMENT OPERATOR	5 HEAVY EQUIPMENT OPERATOR II	6	7	8
JUNE	1	OPERATING EQUIPMENT	$ 1,695.40	$ 675.55	$ 311.91*	$ 63.63	$ 611.36			
	2	OPERATING EQUIPMENT					96.76			
	3	OPERATING EQUIPMENT					23.60*			
	13	OPERATING EQUIPMENT				43.56				
	14	OPERATING EQUIPMENT			111.98*	116.16				
	15	OPERATING EQUIPMENT			115.97*	116.16				
	16	OPERATING EQUIPMENT				116.16				
	17	OPERATING EQUIPMENT				116.16				
	20	OPERATING EQUIPMENT				116.16				
	21	OPERATING EQUIPMENT				58.08				
	22	OPERATING EQUIPMENT				116.16				
	23	OPERATING EQUIPMENT			47.92	68.97				
	24	OPERATING EQUIPMENT		31.74*			9.44*			
	27	OPERATING EQUIPMENT	52.40*	38.60*		116.16	56.64*			
	28	OPERATING EQUIPMENT				116.16				
	29	OPERATING EQUIPMENT				116.16	75.52			
	30	OPERATING EQUIPMENT			119.16*	116.16	75.52			
JULY	1	OPERATING EQUIPMENT			95.84	58.08	75.52			
	5	OPERATING EQUIPMENT			139.61	58.08	75.52			
	6	OPERATING EQUIPMENT			95.84		75.52			
	7	BUILD BRIDGE; O.E.	125.76	61.76			151.04			
	8	FIX BRIDGE; O.E.	68.12*	50.18*			122.72			
	11	OPERATING EQUIPMENT					23.60*			
	12	FIX BRIDGE; (4 PILES) O.E.	137.55	67.55			75.52			
	13	FIX BRIDGE; (8 PILES) O.E.	86.44	42.46*			75.62			
	14	FIX BRIDGE; (4 PILES) O.E.	125.76	61.76*			75.52			
	15	FIX BRIDGE	125.76	61.76						
	18	FIX BRIDGE; (8 PILES) O.E.	125.76	61.76			75.52			
	19	FIX BRIDGE; O.E.	125.76	61.76			75.52			
	20	FIX BRIDGE; O.E.	137.55	67.55			75.52			
①	21	FIX BRIDGE	125.76	61.76						
	25	FIX BRIDGE	59.30*	19.30*						
	27	FIX BRIDGE	125.76	61.76						
	28	FIX BRIDGE	125.76	61.76						
	29	FIX BRIDGE	125.76	61.76						
		TOTALS	$ 1,836.62	$ 943.77	$ 456.23	$ 1,511.90	$ 1,375.88			
		GRAND TOTAL						$ 6,126.40		

* - PRORATED

① - SEE "DAY ON JOB STUDY" PGS. 33-39 AND SEE APPENDIX II E FOR PHOTOGRAPHS

APPENDIX II-G

1. Are there specific projects finishing in 1981 done by you that you would be willing to give "confidential" cost figures on?

2. What were/are the unit prices for a ton of asphalt delivered to the jobsite for 1974 _____, 1981 _____, 1983 _____?

3. What were your typical equipment rental costs in 1981?

4. What costs other than direct job costs (material, labor, equipment, and job-related overhead) are considered in your bids for contract work; i.e., general office overhead, markup %, labor indirect costs - FICA, U.C., etc., sales tax, maintenance of utilities and construction yard, etc.?

5. What are your cost accounting procedures (with relevant forms)? Job payroll with work quantity and weekly labor reports, etc.

6. Are there any projects that you know of which were completed in 1981 that were originally put out for contract bids but were finally done by Public Works Department?

7. Where are your materials obtained, particularly asphalt and limerock? Do you manufacture your own asphalt?

8. Do you operate borrow pits?

9. Do you buy limerock and fill at jobsite?

10. In your opinion, has county work increased or decreased in the last five years in terms of the percentage of finished paved roads?

11. Do you have any figures on total amounts of road construction done in Putnam County - 1977 to the present? If so, please send us a copy?

12. In your opinion, how does the county determine whether road construction work should be "contracted out" or done in-house by the county?

13. Are there portions of your work that are "subcontracted out"? If so, what techniques are most frequently used by you in arriving at a decision to do work yourself versus subcontracting it out?

14. Do there exist definitions of various types of road construction done? For example, ordinary maintenance, maintenance replacement, and incidental construction.

15. How seasonal and/or subject to fluctuations is the volume of asphalt roadwork which you do?

16. As you see it, what are the advantages to the county of "contracting out" its roadwork?

III. GOVERNMENTAL REGULATIONS AND ACCOUNTING SYSTEMS CURRENTLY IN USE

In addition to the writings on the force account issue discussed in Section II, Step 1, information was gathered from various State Highway Departments and Departments of Transportation, describing regulations, and cost accounting and recording frameworks used by the respective governmental units.

This topic is being presented as a separate section because of its relevance to the situation found at the Putnam County Public Works Department.

In our investigation of the force account issue, with the Putnam County Public Works Department being the focus of the study, certain deficiencies have been discovered, particularly with respect to cost control. The cost accounting and recording frameworks that other states have implemented in an effort to attain maximum efficiency, follow:

OREGON

The State of Oregon has developed an outline of "Cost Accounting Guidelines" which is broken down into six sections including: Numeric Coding System, Personal Services Costs, Materials, Equipment Usage Rates, Overhead and Related Costs, and Financial Reporting. The guidelines are as follows:

I. NUMERIC CODING SYSTEM

A numeric coding system for accounting purposes should be developed. Each project will be assigned an account number. Entities with automated accounting systems are encouraged to establish cost centers for accumulating project costs. Many related costs may be incurred long before construction actually

begins. Project accounting codes are, therefore, essential to ensure that all chargeable costs are recorded.

II. PERSONAL SERVICES COSTS

A. The use of detailed time records is a fundamental requirement for accurately accumulating labor costs. Employee time records should provide information at an hourly level for type of activity and by project.

B. The costs of employee vacation, sick leave, all other employer paid insurance and/or retirement benefits, and all other employer paid benefits should be reflected in hourly charge rates. Workers' Compensation costs used in this calculation shall be based on actual rates paid.

C. Travel time to and from the job site should be charged to the project.

III. MATERIALS

A. Materials issuance from inventory or stores for use on a particular project should be documented by requisition forms.

B. Direct material purchases for use on a specific project should be documented by purchase orders and invoices.

C. Costs of other supplies not directly chargeable to a specific project should be considered in overhead calculation.

IV. EQUIPMENT USAGE RATES

A. Agencies may develop internal usage rates based on depreciation schedules, investment cost (ORS 279.023(3)), and operating costs such as fuel, oil, and repairs.

B. Agencies may use widely accepted rate schedules such as those used by the Oregon State Highway Division for "external" work

such as force account or price agreement.

V. OVERHEAD AND RELATED COSTS

A. All general administrative and other "overhead" expenses directly or indirectly applicable to construction activities should be identified and charged. The use of formula or percentage charge rates is acceptable if those rates are supported by documentation. Documentation would consist of workpapers showing the rationale and computations for allocating general administrative expenses.

B. Accounting principles require the capitalization of a wide range of ancillary costs. Examples are engineering, legal and other professional fees, acquisition costs, freight and transportation, and site preparation.

VI. FINANCIAL REPORTING

The final project costs will be closed to the appropriate ledger account. Public agencies are encouraged to prepare cost reports on completion of each project.

The preceeding Executive Department cost accounting guidelines are not intended to serve as an accounting manual, but as a listing of general procedures which in their opinion are necessary to comply with Oregon Statutes and Generally Accepted Accounting Principles. (See Appendix III-A for Oregon State Senate Bill 341 which "requires public agency doing own construction to prepare adequate plans and specifications and the estimated unit cost of each classification of work. Prohibits agency from doing such work at cost over $5,000 unless agency substantially complies with model cost accounting guidelines.")

PENNSYLVANIA

As indicated earlier in the report, the implementation of appropriate cost function codes is critical in the development of an efficient cost accounting and recording system. The State of Pennsylvania has developed quite a thorough system of Program Coding Charts. They are available through the Pennsylvania State Department of Transportation.

LOUISIANA

In order for a cost coding system to be effective, there must be a legitimate reporting and recording system. The Louisiana Department of Transportation and Development has formulated a "Maintenance Reporting Manual."

The "manual provides instructions for preparing and checking forms for reporting maintenance work. The reporting procedures help the employee do the job more efficiently and accurately. Using the procedures helps in reporting the correct description of the kind of work done and the correct amount of work done. In addition, it would be expected that all labor, equipment and materials used would be charged to the proper work function."

"The first section of the manual takes one through step by step procedures for preparation of the following forms:"

Daily Work Report

Biweekly Activity Report

Biweekly Activity Report Recap

Employee Biweekly Payroll

Equipment Repair Order

Shop Daily Work Record

Equipment Repair Summary

The first section "is followed with coding information and function descriptions which must be used as guidelines for maintenance work reporting." (See Appendix III-B for "Table of Contents" to this Manual.) The authors of this study STRONGLY RECOMMEND the reading of this Manual to Directors of public agencies involved in this type of work.

U.S. DOT AND WISCONSIN

When a legitimate cost accounting and reporting system is actually in place, the ongoing process of determining the relative efficiencies of contracting out for a particular maintenance job versus doing the work in-house should be similar to the process put forth by the U.S. Department of Transportation or the Wisconsin Department of Transportation. (See Appendix III-C.)

In dealing with the force account question, in which public project productivity is a major issue and cost comparisons must, therefore, be considered, there arises the difficulty with estimating costs. Certainly this was apparent from our experience in Putnam County. (The cost of performing road construction work by 'state' forces is only an estimate.) "It will vary depending upon the type of cost data available, how administrative and other types of overhead are treated, the level of activity of the working unit in question, and whether or not the equipment and expertise necessary to perform the activity are readily available. It was also noted that accurate analysis requires comparability of quality, specifications, quantity, etc. Even if this comparability test is met, the 'state' force costs would still remain only an estimate."

CALIFORNIA

In order to lessen the difficulties associated with cost

estimation processes and cost comparisons, and in an effort to save taxpayers money, the California legislature through the lobbying efforts of the Construction Industry Force Account Council has passed Bill #AB1666, which sets the groundwork for determining a uniform way to check public construction costs.

In early 1982, the AGC working with the Construction Industry Force Account Council (CIFAC), the League of California Cities, and the County Supervisors Association of California (CSAC) formed a task force to develop a Uniform Cost Accounting Bill. (See Appendix III-D.)

The task force has met monthly and has, at its January 10, 1983 meeting, developed a draft bill to be presented to the legislature before the February 4, 1983 deadline.

The following summary of the development and major parts of the "Uniform Cost Accounting Bill" was received by the Construction Industry Force Account Council (CIFAC).

1. A 12 member California Uniform Construction Cost Accounting Commission will be appointed by the Controller. Six members from industry (two general contractors, two subcontractors, and two from labor) and six members from public agencies.

2. Commission will develop uniform cost accounting standards utilizing, among other material, OMB Circular A-76. Commission to submit its recommendation to Controller no later than January 1, 1985. Controller must adopt or reject procedures within 90 days of submission.

3. Force account limits raised to $15,000 for those public agencies adopting uniform cost accounting standards. Limits are reviewed every 5 years and may be adjusted.

4. Provides definitions for public projects and maintenance work.

5. Provides for informal bidding scheme:

   a. Public projects of $25,000 or less may be let by purchase order.

   b. Public projects of more than $25,000 but less than $100,000 may be let by informal bidding.

6. Public projects of $100,000 or more shall be by formal bidding.

7. Commission shall have power to review accounting procedures of any participating public agency where interested party presents evidence that:

   a. agency rejects all bids claiming can do cheaper;

   b. exceeded force account limits;

   c. improperly classified as maintenance.

During review of "a" above, the agency is enjoined from proceeding and if Commission finds against agency the agency must abandon or award to low bidder.

If Commission finds "b" and "c" have been violated, findings are presented to public agency governing body which must within 30 days conduct a public hearing in regard to the findings.

APPENDIX III-A

OREGON LEGISLATIVE ASSEMBLY--1981 Regular Session

B-Engrossed

Senate Bill 341

Ordered by the Speaker June 29
(Including Amendments by Senate May 13 and by House June 29)

Sponsored by Senators McFARLAND, BROWN, Representatives BELLAMY, BROGOITTI, CHERRY, CHREST, FAWBUSH, FORD, GILMOUR, GRANNELL, HAMBY, LINDQUIST, LOMBARD, MAGRUDER, MARKHAM, MASON, OTTO, RIEBEL, RIJKEN, L. ROBERTS, SCHOON, Senators DAY, FADELEY, GARDNER, GROENER, HALLOCK, HANLON, HANNON, HARTUNG, ISHAM, KITZHABER, KULONGOSKI, McCOY, MEEKER, MONROE, ROBERTS, SIMMONS, THORNE, TROW, Representatives ANDERSON, BURROWS, CAMPBELL, DeBOER, JOHNSON, JOLIN, JONES, KENNEDY, KERANS, PRIESTLEY, B. ROBERTS, RUTHERFORD, SPRINGER, VanLEEUWEN, VAN VLIET (at the request of Associated General Contractors)

SUMMARY

The following summary is not prepared by the sponsors of the measure and is not a part of the body thereof subject to consideration by the Legislative Assembly. It is an editor's brief statement of the essential features of the measure.

Requires public agency doing own construction to prepare adequate plans and specifications and the estimated unit cost of each classification of work. Prohibits agency from doing such work at cost over $5,000 unless agency substantially complies with model cost accounting guidelines. [*Grants person adversely affected by agency's violation of prohibition the right to seek injunctive relief.*]

Takes effect January 1, 1982.

Changes public contracting law relating to holidays. Provides that if contractor is a party to a collective bargaining agreement in effect with a labor organization, the collective bargaining agreement relating to holidays will prevail.

Declares emergency, effective on passage.

A BILL FOR AN ACT

Relating to public improvements; creating new provisions; amending ORS 279.023 and 279.334; prescribing an effective date; and declaring an emergency.

Be It Enacted by the People of the State of Oregon:

Section 1. ORS 279.023 is amended to read:

279.023. (1) It is the policy of the State of Oregon that public agencies shall make every effort to construct public improvements at the least cost to the public agency.

(2) Not less than 30 days prior to adoption of its budget for the subsequent budget period, each public agency shall prepare and file with the Commissioner of the Bureau of Labor and Industries a list of every public improvement known to the agency that the agency plans to fund in the budget period, identifying each improvement by name and estimating the total onsite construction costs. The list shall also contain a statement as to whether the agency intends to perform the construction by a private contractor. If the agency intends to perform construction work using the agency's own equipment and personnel on a project estimated to cost more than $50,000, then the agency shall also show its decision conforms to the policy stated in subsection (1) of this section. The list is a public record and may be revised periodically by the agency.

(3) [*Whenever*] Before a public agency [*intends to perform or construct*] constructs a public improvement with its own equipment or personnel: [*, the public agency shall cause to be kept and preserved a full, true and accurate account of the costs of performing the work including all engineering and administrative expenses and a reasonable estimate of the cost, including investment cost, of equipment used.*]

NOTE: Matter in bold face in an amended section is new; matter [*italic and bracketed*] is existing law to be omitted; complete new sections begin with SECTION.

(a) If the estimated cost exceeds $50,000, the public agency shall prepare adequate plans and specifications and the estimated unit cost of each classification of work. The estimated cost of the work shall include a reasonable allowance for the cost, including investment cost, of any equipment used. As used in this paragraph, "adequate" means sufficient to control the performance of the work and to assure satisfactory quality of construction by the public agency personnel.

(b) The public agency shall cause to be kept and preserved a full, true and accurate account of the costs of performing the work, including all engineering and administrative expenses and the cost, including investment costs, of any equipment used. The final account of the costs shall be a public record.

(4) [*Subsection (2)*] Subsections (2) and (3) of this section [*does*] do not apply to any public agency when the public improvement is to be used for the distribution or transmission of electric power.

SECTION 2. If a public agency fails to adopt and apply a cost accounting system that substantially complies with the model cost accounting guidelines developed by the Executive Department pursuant to section 3, chapter 869, Oregon Laws 1979, as determined by an accountant qualified to perform audits required by ORS 297.210 and 297.405 to 297.555 (Municipal Audit Law), the public agency shall not perform or construct a public improvement with its own equipment or personnel if the cost is in excess of $5,000.

SECTION 3. Section 2 of this Act is added to and made a part of ORS 279.011 to 279.056.

Section 4. ORS 279.334 is amended to read:

279.334. (1) In all cases where labor is employed by the state, county, school district, municipality, municipal corporation, or subdivision, through a contractor, no person shall be required or permitted to labor more than eight hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or where the public policy absolutely requires it, in which event, the person or persons so employed for excessive hours shall receive at least time and a half pay for all overtime in excess of eight hours a day, and for work performed on Saturday and on the following legal holidays:

(a) Each Sunday.

(b) New Year's Day on January 1.

(c) Memorial Day on the last Monday in May.

(d) Independence Day on July 4.

(e) Labor Day on the first Monday in September.

(f) Thanksgiving Day on the fourth Thursday in November.

(g) Christmas Day on December 25.

(2) For the purpose of this section, each time a holiday, other than Sunday, listed in subsection (1) of this section falls on Sunday, the succeeding Monday shall be recognized as a legal holiday. Each time a holiday listed in subsection (1) of this section falls on Saturday, the preceding Friday shall be recognized as a legal holiday.

(3) Subsections (1) and (2) of this section do not apply to a contract for a public improvement if the contractor is a party to a collective bargaining agreement in effect with any labor organization.

[*(3)*] (4) When specifically agreed to under a written labor-management negotiated labor agreement, a laborer may be paid at least time and a half pay for work performed on any legal holiday specified in ORS 187.010 and 187.020 that is not listed in subsection (1) of this section.

[(4)] (5) This section shall not apply to labor performed in the prevention or suppression of fire under contracts and agreements made pursuant to the authority of the State Forester or the State Board of Forestry, under ORS 477.406.

SECTION 5. Sections 1 to 3 of this Act take effect January 1, 1982.

SECTION 6. This Act being necessary for the immediate preservation of the public peace, health and safety, an emergency is declared to exist, and the amendments to ORS 279.334 by section 4 of this Act take effect on its passage.

APPENDIX III-B

APPENDIX III-B

State of Louisiana's Maintenance Work Reporting Manual

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

APPENDIX III-C

STATE OF WISCONSIN

DEPARTMENT OF TRANSPORTATION

FACILITIES DEVELOPMENT MANUAL

Originator	Procedure
CHIEF DESIGN ENGINEER	7-15-1

Chapter	7	PROGRAMMING AND SCHEDULING
Section	15	NEGOTIATED CONTRACT CONSIDERATIONS
Subject	1	POLICY ON CONSTRUCTION OF FEDERAL-AID HIGHWAY PROJECTS BY MUNICIPALITIES

GENERAL

If a county or other unit of local government wishes to construct a federal-aid highway project with its own work force and equipment, it must comply with the Wisconsin Department of Transportation's (WisDOT's) "Policy on Construction of Federal-Aid Highway Projects by Forces and Equipment of Counties or Other Local Governmental Units." The policy has been written to define WisDOT's position, as administrator of federal-aid projects, regarding non-competitive bid contracts (negotiated contracts) with local units of government (municipalities). The policy establishes general procedures and criteria for entering into negotiated contracts.

A copy of the policy is attached to this procedure as Figure 1. Background information and guidelines for the implementation of the policy are discussed in this procedure. Questions that remain unanswered about provisions of the policy should be directed to staff of the Design Section of the Division of Highways and Transportation Facilities.

BACKGROUND TO THE POLICY

Before a municipality will be allowed to enter into a negotiated contract with WisDOT, it must show that interests of the public will be best served by using municipality forces and equipment rather than those of a private contractor. This is done by making a Public Interest Finding, which is simply an evaluation and a determination that the public's general overall interests will benefit by a certain method of doing the work.

The basis for a public interest finding lies in federal law. Section 112(b) of Chapter 1, Title 23, United States Code, states that "Construction of each project...shall be performed by contract awarded by competitive bidding, unless the Secretary [of the U. S. Department of Transportation] shall affirmatively find that, under the circumstances related to such project, some other method is in the public interest." The phrase "public interest finding" comes from this section of federal law.

Federal law is implemented by federal regulation. Section 635.105 of Chapter 1, Title 23, Code of Federal Regulations, states that:

1. "(b) When a project is not located on a highway system over which the State highway agency has legal jurisdiction, or when other special conditions warrant, the State highway agency may arrange for a local public agency having jurisdiction over such streets or highways to perform the work with its own forces, or to let a contract therefor, provided the division administrator approves such proposed arrangements in advance and provided all the following conditions are met:

"(1) There is an agreement between the State highway agency and the local public agency setting forth the conditions under which the project will be constructed. The agreement shall provide that construction work performed by or under the supervision of a local public agency will be subject to inspection at all times by the State highway agency and the FHWA."

"(2) The state highway agency certifies that the work can be more advantageously performed by the local public agency.

"(3) The local public agency is paying part of the cost of the work or has other special interest therein.

"(4) The local public agency is adequately staffed and suitably equipped to undertake and satisfactorily complete the work.

"(5) In the case of force account work, there is full compliance with Subpart B of this Part."

Note particularly the requirements written into the regulations that the state must certify the work can be performed more advantageously by the municipality, the municipality is paying part of the cost or has a special interest in the project, and the municipality is adequately staffed and suitably equipped to do the work.

POLICY REQUIREMENTS FOR A PUBLIC INTEREST FINDING

The "Public Interest Finding" section of WisDOT policy lists four requirements for a public interest finding.

EITHER

1. The nature or size of the work makes it unsuitable for performance by competitive bidding. This means the type of work or the amount of work would not attract bids from private contractors except at inflated costs.

OR

The municipality needs the work to provide reasonably stable employment for personnel necessary to perform normal maintenance and traffic services. This means the municipality will not have to hire extra employees or work overtime to do the federal-aid work.

2. The municipality is properly staffed and equipped to perform the work. This means they will not have to specially train their employees or buy or rent equipment to do the federal-aid work.

3. The costs will not exceed those costs that would be obtained through competitive bidding. This means that the municipality must show that they can do the work at equal or less cost than under a let contract, otherwise serious questions can be raised about there being any public benefit by having the municipality do the work.

4. Prior commitments by the municipality to do work for other municipalities will not impair performance of the federal-aid project. This means that the municipality must be able to muster sufficient personnel and equipment to do the proposed federal-aid work without a time delay or a decrease in quality, despite agreements with other local governmental units for construction, traffic, or maintenance services.

A public interest finding will not be needed in certain cases where the Federal Highway Administration (FHWA) has already made a "blanket" public interest finding. The FHWA has determined that it is in the public interest to use the negotiated contract method on any highway system for these types of work:

1. Projects to adjust utilities and railroad facilities owned or operated by a public agency, railroad company, or a utility company (FHPM 6-4-1-14).

2. Emergency repairs to restore services or to protect facilities, with the concurrence of the FHWA (FHPM 6-4-1-14).

3. Projects funded with Federal Highway Safety Improvement Program funds (FHPM 6-4-1-14 and 6-8-2-1). Refer to the District Office of WisDOT for the most current listing of federal-aid fund types included in this program.

   Although a public interest finding is not needed, WisDOT's recent experiences with higher than estimated costs for these Safety Program projects requires that the municipality submit the following to the District Office:

   a. Location and type of work
   b. Quantity of work
   c. Estimated total cost
   d. Anticipated cost savings over a let contract

PROCEDURE FOR COMPLYING WITH THE POLICY

The municipality should follow these general steps when developing a negotiated contract with WisDOT:

1. Prepare a public interest finding and submit it to the appropriate District Office of WisDOT.

2. Have the finding accepted by the District Director, approved by the Chief Design Engineer, and concurred in by the FHWA, as necessary.

3. Develop a negotiated contract through interaction with the District Office of WisDOT.

4. Submit a final contract and final construction plans, specifications, and estimates (P.S. & E.) for approval.

These steps will be discussed in detail in the following sections of this procedure.

Preparing and Submitting a Public Interest Finding

Very early in the development of a federal-aid highway project, the sponsoring municipality should decide if it has the capability and wishes to construct the project with its own work force and equipment. If the answer is yes, a written public interest finding containing the following information must be submitted to the appropriate District Director:

1. Project location
2. Nature of the project
3. Proposed funding
4. Cost analysis
5. Cost estimate
6. Private contract cost comparison
7. Justification

Project Location: Describe where the project is located, its termini, and its length. Include a map whenever possible. Note that the policy sets a project length limitation. Exceeding that limitation must be justified.

Nature of the Project: State what type of construction is proposed. Note that the policy states the types of work that are allowed. Exceptions must be justified.

Proposed Funding: State the type of anticipated federal aid and the amount or percentage of construction costs that the municipality expects to pay. If there is some special interest or arrangement that may affect the amount the municipality will pay, it should be stated.

Cost Analysis: The following process is quite detailed and involved. The municipality should understand, however, that the policy does not require a detailed cost analysis or negotiated contract unit prices at this stage. Rather, the cost analysis needs to be only as detailed as is necessary to show that it will not cost more to do the work with municipality forces than with private forces.

The use of rough but reasonable estimates of work quantities is acceptable. Current rates for wages and machinery rental may be used without updating to the construction year. Municipality experience under recent and comparable projects may be used to set production rates for personnel and equipment. An acceptable alternative method of making a cost analysis is to select realistic unit prices that were obtained on a recent and comparable project done by the municipality's work force and equipment.

A detailed cost analysis is the procedure used to determine the cost of doing one unit of work for each of the work items involved in the project. The cost analysis is an important part of the request since it forms the factual basis for determining total cost of the project. Examples are to be found in Procedure 19-25-1 for an Agreed Unit Price contract (AUP) and Procedure 19-25-5 for a Service and Supply contract (S&S).

To make a detailed cost analysis:

1. Isolate a work item and estimate its quantity.

2. Determine equipment that is needed to do that work.

3. Determine the number of personnel and their job classifications needed to do the work.

4. Determine the production rate of personnel and equipment.

5. Calculate hours of production by dividing the quantity by the production rate.

6. Calculate equipment cost by multiplying the hours of production by the current machinery rental rate.

7. Calculate personnel cost by multiplying the hours of production by the current labor rate for that classification.

8. Determine cost of materials.

9. Add the cost of equipment, personnel, and materials to get the total work item cost.

10. Divide the total work item cost by the quantity to get the cost per unit of work (unit price). This process is then repeated for each work item.

Cost Estimate: Developing an estimate of the cost of the whole project follows, and is based on, the cost analysis. If the cost analysis method outlined above in steps 1 through 10 is used, the total project cost will then be the summation of all work item costs. Use of the alternative method of selecting unit prices from municipality experience will require multiplying each work item quantity by its unit price. The total project cost will be the summation of all work item costs.

A suggested cost estimate format is shown in Procedure 19-25-5. Note that the policy sets criteria for the allowable dollar size of projects. Exceeding that limitation must be justified.

Private Contract Cost Comparison: After determining the total cost if the project is constructed by the municipality, local officials must compare that total with the estimated cost if done by private contractor under a competitive bidding process. Unit prices may be established by review of recent and comparable contracts awarded to private firms. These are available in the district offices of WisDOT. Lack of available contractors in the area or a lack of interest on their part should be considered in setting unit prices. From these unit prices a cost estimate may be developed. Comparison of the two totals should show a cost savings under a negotiated contract.

Justification: This part of the public interest finding will consist of positive statements addressing each of the four requirements of the "Public Interest Finding" section of the policy.

Approving a Public Interest Finding

The finding should be reviewed by WisDOT district personnel. If it is found acceptable by the District Director, it may then be transmitted to the Chief Design Engineer, together with a recommendation for action.

The Chief Design Engineer has been given authority by the Administrator of the Division of Highways and Transportation Facilities to approve or disapprove all public interest findings except as noted below. The Administrator will approve or disapprove those public interest findings proposing the exceeding of policy limits for project length, type, cost, or district quota. Action by the Administrator will be considered an approval or disapproval of both the public interest finding and the exception.

Following these actions, findings for projects to be administered under the Secondary Road Plan (Procedure 5-5-15) will be returned to the District. Findings for projects not administered by the Secondary Road Plan must be concurred with by the FHWA. Their concurrence will be requested by the Design Section.

As stated previously in this procedure, projects that will be financed with Safety Program funds do not require a separate public interest finding as they are covered by a "blanket" finding made by the FHWA. However, the Chief Design Engineer is to be advised by the District of the project location, type of work, estimated quantities, total cost, and anticipated savings over a let contract. This is to be done before preparation of a negotiated contract is begun.

Developing a Negotiated Contract

The municipality may proceed to develop a contract after being informed by the District that the public interest finding and any exceptions to policy criteria have been approved. Contract forms and guidance in their use will be supplied by the District upon request.

Cost Analysis: All negotiated contracts must include a detailed cost analysis, which is to be prepared in the manner set forth in the ten-step method discussed earlier in this procedure. It should include costs for labor by classification, equipment, and materials used in the work operation, as based on current wage rates, current machinery rental rates, and current materials costs. Production rates and quantity estimates are to be realistic. A form on which the analysis may be prepared is available through the District.

Payment to a municipality for performance of a particular work item under an AUP contract will be based on the unit price shown in the cost analysis. The quantity of the work item may vary from the estimate, but the unit price will remain fixed for the life of the contract.

Borrow pits, gravel pits, and quarries are to be located and details of loading and hauling determined at the time the cost analysis is prepared. Changes in pit location should be reviewed by the District, as they may affect the analysis and subsequently require a change order to a Service and Supply contract.

Cost Estimate: A cost estimate must be included with S&S contracts. The estimate should state the quantity, cost of each work item, and total contract cost. An example is shown in Figure 1 of Procedure 19-25-5. Because the cost

estimate will control the actual upper limit of payment to the municipality, care must be taken in its preparation.

Reimbursement to a municipality for performance of a particular work item under an S&S contract will be based on the actual costs incurred. However, the total reimbursement for all work items will be limited to the total shown in the cost estimate unless revised by approved contract change orders. CCO's must be submitted and approved before the work in question is started.

Considerations in Developing the Contract: Contract prices are developed using rates for labor and machinery that are current at the time the contract is negotiated. Occasionally those rates change before work is actually performed. The local unit of government would then be required to perform the work at rates less than what they will actually have to pay and would thus incur a loss. The policy requires that the rates established in the contract shall remain unchanged throughout the life of the contract. The unit prices should therefore be developed and the contracts executed after the rates have been established for the year in which construction is to be performed. Even with a 17-week lead time requirement (or 10 weeks if not included in the same federal agreement with a bid contract), there is generally adequate time between finalization of labor and machinery rates and the start of the ensuing construction season to allow development of unit prices based on appropriate rates for labor and machinery. Projects for which the proposed work is expected to extend beyond one construction season would normally be of sufficient magnitude that it would be more appropriate to construct them through the competitive bidding process.

Subcontracting will not be allowed except for minor quantities of specialty items or services done for the municipality under an established, ongoing contract.

The municipality may not add equipment to its current inventory in order to perform the proposed federal-aid project; however, it may replace worn-out or obsolete equipment.

Submitting the Contract and P.S. & E.

Refer to Procedure 19-25-1 for the composition and processing of AUP contracts and P.S. & E. submittals. Refer to Procedure 19-25-5 for the composition and processing of S&S contracts and P.S. & E. submittals. Necessary agency approvals are discussed in Procedure 3-20-45.

DISTRICT LIMITATIONS ON NEGOTIATED CONTRACTS

It will be the responsibility of each District to review their federal-aid programs in order to be assured that the district dollar limitation is not exceeded. If a proposed project will cause the limit to be exceeded, the situation should be brought to the attention of the Chief Design Engineer when sending in the public interest finding.

* * * * * * * * * * * * * *

APPENDIX III-D

U. S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

FEDERAL-AID HIGHWAY PROGRAM MANUAL

VOLUME	6	ENGINEERING AND TRAFFIC OPERATIONS
CHAPTER	4	CONSTRUCTION AND MAINTENANCE
SECTION	1	GENERAL

SUBSECTION 14 CONTRACT AND FORCE ACCOUNT (JUSTIFICATION REQUIRED FOR FORCE ACCOUNT WORK)

Transmittal 127
April 9, 1975
HHO-32

Par. 1. Purpose
2. Application
3. Definitions
4. Determination of Public Interest
5. Finding of Public Interest
6. Report to Congress

1. PURPOSE

**The purpose of this directive is to prescribe procedures in accordance with 23 U.S.C. 112(b) for a State highway agency to request approval that highway construction work be performed by some other method than by contract award by competitive bidding.*

2. APPLICATION

This directive applies to all Federal-aid and other highway construction projects financed in whole or in part with Federal funds and to be constructed by a State highway agency or a subdivision thereof in pursuance of agreements between any State highway agency and the Federal Highway Administration (FHWA) except projects constructed under a Certification Acceptance Plan in those States where the Secretary has discharged his responsibility pursuant to 23 U.S.C. 117. (Reporting of Force Account Affirmative Findings on Certification Acceptance (CA) projects, except projects on the FAS System, is required as prescribed in the Federal-Aid Highway Program Manual 6-5-2, Attachment 2.)

3. DEFINITIONS

The following definitions shall apply for the purposes of this directive:

*Regulatory material is italicized.

a. A "State highway agency" is that department, commission, board, or official of any State charged by its laws with the responsibility for highway construction. The term "State" should be considered equivalent to "State highway agency" if the context so implies.

b. The term "some other method" of construction as used in U.S.C. 112(b) shall mean the "force account" method of construction as defined herein. In the unlikely event that circumstances are considered to justify a negotiated contract or another unusual method of construction, the policies and procedures prescribed herein for force account work will apply.

c. The term "force account" shall mean the direct performance of highway construction work by a State highway agency, a county, a railroad, or a public utility company by use of labor, equipment, materials, and supplies furnished by them and used under their direct control.

d. The term "county" shall mean any county, township, municipality or other political subdivision that may be empowered to cooperate with the State highway agency in highway matters.

4. DETERMINATION OF PUBLIC INTEREST

a. Congress has expressly provided in the cited legislation that the contract method based on competitive bidding shall be used by a State highway agency or county for performance of highway work financed with the aid of Federal funds unless there is an affirmative finding that under the circumstances relating to a given project it is in the public interest to perform the work by some other method.

b. It may be found in the public interest for a State highway agency or county to undertake a federally financed highway construction project by force account when a situation exists in which the rights or responsibilities of the community at large are so affected as to require some special course of action, including situations where there is a lack of bids or the bids received are unreasonable. The cost, by force account, in all cases must be reasonable.

c. No precise rules can be prescribed nor can specific examples be followed. If, however, a State highway agency or county in order to perform force account work

must acquire or rent substantially more equipment than required for its normal operations or if force account work by a particular organization shows a substantial increase over a preceding year, it would be difficult under such circumstances to justify an affirmative finding compatible with the foregoing authorization.

5. FINDING OF PUBLIC INTEREST

a. *Pursuant to authority in 23 U.S.C. 112(b), it is hereby determined that:*

(1) *By reason of the inherent nature of the operations involved it is in the public interest to perform by force account the adjustment of railroad or utility facilities and similar type facilities owned or operated by a public agency, a railroad, or a utility company, provided the costs are reasonable and that the organization is qualified to perform the work in a satisfactory manner. The installation of new facilities shall be undertaken by competitive bidding except as provided in subparagraphs 5. b. and c. below. The term "adjustment of railroad facilities" includes the installation of grade crossing warning devices, crossing surfaces, and minor track and signal work. The term "adjustment of utilities" includes minor installations of new facilities to provide power, minor lighting, telephone, water and similar utility services to a rest area, weigh-station, movable bridge, or other highway appurtenance, provided such installation cannot feasibly be done as incidental to a major installation project such as an extensive highway lighting system.*

(2) *Because of the urgent necessity for timely completion of temporary operations (i.e., emergency repairs, the need for which is concurred in by the Division Engineer, undertaken during or immediately following the occurence of a natural disaster or catastrophic failure, to reduce the extent of damage, to protect remaining facilities or to restore travel), it is in the public interest to perform such temporary operations either by force account or by the contract method. Therefore, the work may be performed by the method most suited for the work and a formal affirmative finding is not required in either case.*

(3) Subparagraph 7b(1) in FHWA directive entitled, "Highway Safety Improvement Program" (Volume 6, Chapter 8, Section 2, Subsection 1) stipulates that "The FHWA finds it to be in the public interest for a State highway agency or local government to use its own forces for highway safety improvement projects, if the State highway agency so requests." It is, therefore, unnecessary for the Division Engineer to make an affirmative finding of public interest on such projects but the force account work must be reported to Washington Headquarters to fulfill the requirements of 23 U.S.C. 112(b).

b. *When a State highway agency desires that highway construction work financed with the aid of Federal funds, other than the kinds of work designated under subparagraph 5a or projects constructed under an approved Certification Acceptance Plan, be undertaken by force account, it shall submit a written request to the Division Engineer identifying and describing the project and the kinds of work to be performed, the estimated costs therefor, the estimated Federal funds to be provided, and setting forth the reason or reasons that force account for such project is considered to be in the public interest.*

c. *The Division Engineer shall notify the State highway agency in writing of his determination that under the circumstances relating to the project, force account is or is not found to be in the public interest.* He shall promptly submit to the Washington Headquarters through the regional office, single copies of the State's request, and his reply to the State highway agency. The Regional Administrator shall periodically review the Division Engineer's finding from an overall program standpoint.

6. REPORT TO CONGRESS

The Associate Administrator, Office of Engineering and Traffic Operations, is responsible for preparing the report for the Committees on Public Works of the Senate and the House of Representatives on all affirmative findings as required by 23 U.S.C. 112(b).

APPENDIX III-E

APPENDIX III-E

AMENDED IN SENATE JUNE 29, 1983

AMENDED IN SENATE JUNE 23, 1983

AMENDED IN ASSEMBLY MAY 3, 1983

AMENDED IN ASSEMBLY APRIL 12, 1983

CALIFORNIA LEGISLATURE—1983-84 REGULAR SESSION

ASSEMBLY BILL No. 1666

Introduced by Assemblyman Cortese

March 3, 1983

An act to add Chapter 2 (commencing with Section 21000) to Part 3 of Division 2 of the Public Contract Code, relating to public agencies.

LEGISLATIVE COUNSEL'S DIGEST

AB 1666, as amended, Cortese. Uniform Public Construction Cost Accounting Act.

(1) Existing law does not provide a uniform cost accounting standard with respect to construction work performed or contracted by local public agencies.

This bill would create the California Uniform Construction Cost Accounting Commission. It would prescribe the membership and terms of office of its members. It would specify the duties of the commission including, recommending uniform construction cost accounting procedures for implementation by public agencies in the performance of, or in contracting for, construction on public projects and to report to the Controller for his or her adoption and to report to the Legislature regarding the development and implementation of the procedure. It would require the Controller to promulgate a uniform procedure for all local public agencies which elect to implement the procedure.

(2) Existing law prescribes various procedures regarding

bidding.

This bill would establish, as an alternative to the other bidding procedures, a specified bidding procedure.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. Chapter 2 (commencing with Section 21000) is added to Part 3 of Division 2 of the Public Contract Code, to read:

CHAPTER 2. BIDDING ON PUBLIC CONTRACTS

Article 1. Legislative Intent and Definitions

21000. This chapter shall be known and may be cited as the "Uniform Public Construction Cost Accounting Act."

21001. The Legislature finds and declares that there is a statewide need to promote uniformity of the cost accounting standards and bidding procedures on construction work performed or contracted by public entities in the state. This chapter provides for the development of cost accounting standards and an alternative method for the bidding of public works projects by public entities.

21002. (a) "Public agency" for purposes of this chapter, means a city, county, city and county, including chartered cities and chartered counties, any special district, and any other agency of the state for the local performance of governmental or proprietary functions within limited boundaries.

(b) "Representatives of the construction industry" for purposes of this chapter, means a general contractor, subcontractor, or labor representative with experience in the field of public works construction.

(c) "Public project" means any of the following:

(1) Construction, reconstruction, erection, alteration, renovation, improvement, demolition, and repair work

involving any publicly owned, leased, or operated facility.

(2) Painting or repainting of any publicly owned, leased, or operated facility.

(3) In the case of a publicly owned utility system, "public project" shall include only the construction, erection, improvement, or repair of dams, reservoirs, power plants, and electrical transmission lines of 230,000 volts and higher.

(d) "Public project" does not include maintenance work. For purposes of this section, "maintenance work" includes all of the following:

(1) Routine, recurring, and usual work for the preservation or protection of any publicly owned or publicly operated facility for its intended purposes.

(2) Minor repainting.

(3) Resurfacing of streets and highways at less than one inch.

(4) Landscape maintenance, including mowing, watering, trimming, pruning, planting, replacement of plants, and servicing of irrigation and sprinkler systems.

(5) Work performed to keep, operate, and maintain publicly owned water, power, or waste disposal systems, including, but not limited to, dams, reservoirs, power plants, and electrical transmission lines of 230,000 volts and higher.

(e) For purposes of this chapter, "facility" means any plant, building, structure, ground facility, utility system, subject to the limitation found in paragraph (3) of subdivision (c), real property, streets and highways, or other public work improvement.

Article 2. California Uniform Construction Cost Accounting Commission

21100. There is hereby created the California Uniform Construction Cost Accounting Commission. The commission is comprised of 12 members appointed by the Controller as follows:

(a) Two members who shall each have at least 10 years of experience with, or providing professional services to,

a general contracting firm engaged, during that period, in public works construction in California.

(b) Two members who shall each have at least 10 years of experience with, or providing professional services to, a firm or firms engaged, during that period, in subcontracting for public works construction in California.

(c) Two members who shall each be a member in good standing of, or have provided professional services to, an organized labor union with at least 10 years of experience in public works construction in California.

(d) Six members who shall each be experienced in, and knowledgeable of, public works construction under contracts let by public agencies; two each representing cities, counties, and special districts, respectively. *At least one of the two county representatives shall be a county auditor or his or her designee.*

21101. The Controller, in an effort to select highly qualified commission members, shall solicit from organized representatives of the construction industry and public agencies recommendations for appointments to the commission.

21102. At least one commission member of the six representing the construction industry and at least one of the six representing public agencies shall have previous accounting experience.

21103. The commission members shall select a chairperson from among its membership. The chairperson shall serve as chair for a term of one year from the date of selection or February 1, whichever comes first. In no event shall two consecutive chairpersons be appointees representing either the construction industry or public agencies.

21104. (a) The members of the commission shall hold office for terms of three years, and until their successors are appointed, except as otherwise provided for in this section.

(b) In the case of members initially appointed by the Controller, two representing the construction industry and two representing public agencies shall be appointed

to serve until July 1, 1985; two representing the construction industry and two representing public agencies shall be appointed to serve until July 1, 1986; and two representing the construction industry and two representing public agencies shall be appointed to serve until July 1, 1987.

(c) Members may be reappointed for subsequent terms of three years.

21105. (a) The Controller shall make available for the conduct of the commission's business, such staff and other support as does not conflict with the accomplishment of the other business of the Office of the Controller.

(b) Each member of the commission shall serve without compensation, but shall be reimbursed for travel and other expenses necessarily incurred in the performance of the member's duties.

(c) The commission may accept grants from federal, state, or local public agencies, or from private foundations or individuals, in order to assist it in carrying out its duties, functions, and powers under this chapter.

21106. The commission shall meet not less than once each year, at a time and place chosen by its membership.

21107. The commission shall do all of the following:

(a) After due deliberation and study, recommend for adoption by the Controller, uniform construction cost accounting procedures for implementation by public agencies in the performance of, or in contracting for, construction on public projects. The procedures shall, to the extent deemed feasible and practicable by the commission, incorporate, or be consistent with construction cost accounting procedures and reporting requirements utilized by state and federal agencies on public projects, and be uniformly applicable to all public agencies which elect to utilize the uniform procedures. As part of its deliberations and review, the commission shall take into consideration relevant provisions of Office of Management and Budget Circular A-76.

(b) Recommend for adoption by the Controller, procedures and standards for the periodic evaluation and

adjustment, as necessary, of the monetary limits specified in Section 21202.

(c) Submit its recommendations to the Controller not later than January 1, 1985. The commission shall report to the Legislature, no later than June 30, 1984, concerning its progress in the development and implementation of the uniform construction cost accounting procedures. Thereafter, the commission shall make an annual report to the Legislature with respect to its activities and operations, together with those recommendations as it deems necessary.

21108. The Controller shall, upon receipt of the commission's recommendations, review and evaluate the recommended procedures and either formally adopt or reject the recommended procedures within 90 days of submission by the commission.

21109. Upon determing that the recommended uniform construction cost accounting procedures will serve the best interests of the state and public agencies, and upon formal adoption by the Controller, the Controller shall promulgate the uniform procedure for all public agencies electing to participate, together with instructions for their adoption and implementation by any public agency.

21110. In accordance with procedures and standards adopted pursuant to Section 21107, every five years the commission shall consider whether there have been material changes in public construction costs and make recommendations to the Controller regarding adjustments in the monetary limits prescribed by Section 21202, but in no case shall the amount, as adjusted, be less than fifteen thousand dollars ($15,000). Any adjustment shall be effective beginning with the fiscal year which commences not less than 60 days following the Controller's notification to affected public agencies of the adjustment.

Article 3. Public Projects: Alternative Procedure

21200. This article applies only to a public agency

whose governing board has by resolution elected to become subject to the uniform construction cost accounting procedures set forth in Article 2 (commencing with Section 21100) and which has notified the Controller of that election. In the event of a conflict with any other provision of law relative to bidding procedures, this article shall apply to any public agency which has adopted a resolution and so notified the Controller.

21201. Nothing in this article shall prohibit a board of supervisors or a county road commissioner from utilizing, as an alternative to the procedures set forth in this article, the procedures set forth in Article 25 (commencing with Section 20390) of Chapter 1.

21202. (a) Public projects of fifteen thousand dollars ($15,000) or less may be performed by the employees of a public agency, by force account, or by negotiated contract.

(b) Public projects of twenty-five thousand dollars ($25,000) or less may be let to contract by purchase order procedures as set forth in this article.

(c) Public projects of more than twenty-five thousand dollars ($25,000) but less than one hundred thousand dollars ($100,000), may be let to contract by informal bidding procedures.

(d) Public projects of one hundred thousand dollars ($100,000) or more shall, except as otherwise provided in this article, be let to contract by formal bidding procedure.

21203. It shall be unlawful to split or separate into smaller work orders or projects any project for the purpose of evading the provisions of this article requiring work to be done by contract after competitive bidding.

21204. (a) Each public agency subject to this article shall adopt ordinances or regulations providing for formal and informal bidding procedures as required by this article for public projects conducted by that public agency.

(b) Each public agency which elects to become subject to the uniform construction accounting

procedures set forth in Article 2 (commencing with Section 21100), shall enact a purchase order ordinance to govern the selection of contractors to perform public projects pursuant to subdivision (b) of Section 21202. The ordinance shall include all of the following:

(1) The public agency shall maintain a list of all qualified contractors, identified according to categories of work.

(2) Before awarding a public project contract, at least three bids must be received by the public agency unless any of the following occurs:

(A) The product or service is proprietary.

(B) All of the qualified contractors on the list have been solicited, but less than three bids have been received.

(3) The public agency shall solicit a sufficient number of qualified contractors from the list in order to obtain three bids.

(4) If at least three bids are not obtained as a result of the first bidding procedure, the public agency shall solicit qualified contractors until either three bids are received or all the contractors on the list have been solicited.

(5) Nothing shall prohibit the public agency from soliciting all contractors on the list for a particular project.

21205. In cases of great emergency, as determined by the governing body of the public agency, including, but not limited to, states of emergency defined in Section 8558 of the Government Code, when repair or replacements are necessary to permit the continued conduct of the operation or services of a public agency or to avoid danger to life or property, the governing body by majority vote, may proceed at once to replace or repair any public facility without adopting plans, specifications, strain sheets, or working details, or giving notice for bids to let contracts. The work may be done by day labor under the direction of the governing body, by contract, or by a combination of the two.

21206. Notice inviting informal bids shall be published at least once and publication shall be completed at least 24 hours before the time scheduled for

opening of the bids. The public agency may cause the notice to be printed as display advertising in such form and style as it deems appropriate. The notice shall describe the project in general terms and state a closing date and time for submission of the informal bids. Publication of notice pursuant to this section shall be in a newspaper of general circulation printed and published within the jurisdiction of the public agency, or, if there is no newspaper printed and published within the jurisdiction of the public agency, in a newspaper of general circulation which is circulated in the jurisdiction of the public agency, and in addition, in a construction trade publication circulated within the jurisdiction of the public agency; or, if there is no newspaper which is circulated within the jurisdiction of the public agency, publication shall be by posting the notice in at least three public places within the jurisdiction of the public agency as have been designated by ordinance or regulation of the public agency as places for the posting of its notices. In addition to notice required by this section, the public agency may give other notice as it deems proper.

21207. Notice inviting formal bids shall state the time and place for the receiving and opening of sealed bids and distinctly describe the project. The notice shall be published at least 30 days before the date of opening the bids in a newspaper of general circulation, printed and published in the jurisdiction of the public agency, and in addition, in a construction trade publication circulated within the jurisdiction of the public agency; or, if there is no newspaper printed and published within the jurisdiction of the public agency, in a newspaper of general circulation which is circulated within the jurisdiction of the public agency, or, if there is no newspaper which is circulated within the jurisdiction of the public agency, publication shall be by posting the notice in at least three places within the jurisdiction of the public agency as have been designated by ordinance or regulation of the public agency as places for the posting of its notices. In addition to notice required by this section, the public agency may give such other notice

as it deems proper.

21208. (a) In its discretion, the public agency may reject any bids presented. If after the first invitation for bids all bids are rejected, after reevaluating its cost estimates of the project, the public agency shall have the option of either of the following:

(1) Abandoning the project or readvertising for bids in the manner described by this article.

(2) By passage of a resolution by a four-fifths vote of its governing body declaring that the project can be performed more economically by the employees of the public agency, may have the project done by force account without further complying with this article.

(b) If a contract is awarded, it shall be awarded to the lowest responsible bidder. If two or more bids are the same and the lowest, the public agency may accept the one it chooses.

(c) If no bids are received, the project may be performed by employees of the public agency by force account, or by informal bidding procedures set forth in Section 21205 without further complying with this article.

21209. The governing body of the public agency shall adopt plans, specifications, and working details for all public projects of more than one hundred thousand dollars ($100,000).

21210. Any person may examine the plans, specifications, or working details, or all of these, adopted by the public agency for any project.

21211. This article does not apply to the construction of any public building used for facilities of juvenile forestry camps or juvenile homes, ranches, or camps established under Article 15 (commencing with Section 880) of Chapter 2 of Part 1 of Division 2 of the Welfare and Institutions Code, if a major portion of the construction work is to be performed by wards of the juvenile court assigned to those camps, ranches, or homes.

21212. The commission shall review the accounting procedures of any participating public agency where an interested party presents evidence that the work

undertaken by the public agency falls within any of the following categories:

(a) Is to be performed by a public agency after rejection of all bids, claiming work can be done less expensively by the public agency

(b) Exceeded the force account limits.

(c) Has been improperly classified as maintenance.

21213. In those circumstances as set forth in subdivision (a) of Section 21212, a request for commission review shall be by letter received by the commission not later than five days from the date the public agency has rejected all bids. In those circumstances set forth in subdivision (b) or (c) of Section 21212, a request for commission review shall be by letter received by the commission not later than five days from the date an interested party formally complains to the public agency. The commission review shall commence immediately and conclude within 30 days from the receipt of the request for commission review. During the review of a project that falls within subdivision (a) of Section 21212, the agency shall not proceed on the project until a final decision is received by the commission.

21214. The commission shall prepare written findings. Should the commission find that the provisions of this chapter or of the uniform cost accounting procedures provided for in this chapter were not complied with by the public agency, the following steps shall be implemented by that agency:

(a) On those projects set forth in subdivision (a) of Section 21212, the public agency has the option of either (1) abandoning the project, or (2) awarding the project to the lowest responsible bidder.

(b) On those projects set forth in subdivision (b) or (c) of Section 21212, the public agency shall present the commission's findings to its governing body and that governing body shall conduct a public hearing with regard to the commission's findings within 30 days of receipt of the findings.

21215. (a) No later than January 1, 1985, the commission shall recommend, for adoption by the

Controller, written procedures implementing the accounting procedures review provided for in this article.

(b) The Controller shall, upon receipt of the commission's recommendation, review and evaluate the recommended procedures and either formally adopt or reject the recommended procedures within 90 days of submission of the commission.

IV. FINAL FINDINGS AND RECOMMENDATIONS

This section incorporates final findings following the interview with Mr. Barry M. Harriss and recommendations for changes in accounting and reporting procedures to facilitate more accurate and valid comparisons.

FINDINGS FOLLOWING THE INTERVIEW WITH THE DIRECTOR

Having concluded the interview with the Director of the Public Works Department, it had been verified that the Department does not have a good conceptualization of costs, and does not maintain cost control information. Nor does the State Uniform Cost Accounting System address the problem of cost control accounting. Thus, there exists no accountability, as to efficiency or productivity.

Mr. Harriss' own feeling was that inefficiencies had existed with respect to new construction work and asphalt production, which resulted in his termination of these activities. Now, a cost accounting system should be established to insure that efficiency exists with respect to maintenance work.

It is evident that within the Public Works Department, as is the case with the public sector as a whole, there is no direct concern with profit and loss, and, therefore, few steps are taken to be efficient. Continued existence does not depend on the ability to do a specific job more efficiently than someone else. There exists no incentive or motivation to be efficient and little penalty for inefficiency. Without continuous records showing cost effectiveness or ineffectiveness, only gross inefficiency is recognized.

The existence of this type of inefficiency had been allowed by the great gap in the record keeping system used by Putnam County. This gap

is mainly in maintaining records of quantity of work done and equipment usage. It has not been possible to accurately reconstruct cost and quantity figures for a specific project. (See Appendix II-F for an analysis of the Bannerville Bridge Project.)

The major finding of the study of the Putnam County Public Works Department cost recording system is that it is impossible to determine productivity for cost comparison purposes from the information that is recorded. In order to develop unit prices one must have usable quantities. The reports we examined are woefully inadequate in this respect. Nor do these reports subcategorize work activities into logical segments for use in cost comparisons.

Therefore, the attention turned to identifying and analyzing the gaps and omissions in the system currently in use, and making recommendations for use by all public agencies contemplating force account work.

The following recommendations are made because of inadequacies found at the Putnam County Public Works Department. That is, there is no adequate method for determining unit cost figures, and, therefore, there exists poor control and inadequate estimating procedures. With respect to pricing, the Public Works Department is aware that previously kept cost records for new construction are not very good. The Department is now trying to use unit prices found in industry estimating manuals like an architect or engineer would use to estimate the cost of a project. They are not, however, using actual cost figures experienced during work, and are, therefore, not determining what it would cost them to do the work.

With respect to management, two of the six "functions of management", (Plan, Organize, Staff, Direct/Supervise, Communicate, and Control), should be stressed within the Putnam County Public Works Department. These are Planning and Control. The area of Control is particularly weak.

The following is a brief description of the six "functions of management."

Managers should plan for the future prior to taking action. They should attempt to anticipate future developments in the environment and adapt their organization to expected needs. Strategic or long-run planning should exist as a process for selecting the appropriate direction suitable to the organization's resources and available opportunities. Planning techniques should also be employed for tactical (short-run) planning. The Putnam County Public Works Department has begun long-range planning with respect to the leasing of equipment.

Managers should organize activities by designing formal structures of authority and responsibility.

Managers should staff the organization by selecting, training, and evaluating people for the needed positions.

Managers should direct or supervise the work of others. They should lead others toward the organization's goals.

Managers should communicate with subordinates, colleagues, and superiors.

Managers should control activities; they should utilize processes that measure actual performance and guide it toward some predetermined goal.[1] Within the Public Works Department, cost reports should be utilized to guide management of construction activity toward

completion of the project within the job budget.

RECOMMENDATIONS

To serve as a guideline or model for cost accounting for public agencies and to correct the present situation within Putnam County, there needs to be some conception of accountability for use of state funds, as well as the tax revenue from the agency's own taxpayers.

To promote accountability in public agency operations we recommend:

1. Cost Control System

New road construction and maintenance is quantifiable and reasonably repetitious, and, therefore, a cost accounting system can be applied. In order for this system to be efficient, there should exist timely reporting, accurate recording of quantities, accurate assignment of labor to activities, etc. A cost control system should be introduced.

Although the Public Works Department has begun implementation of a computerized maintenance system in an effort to increase efficiency, "there is no guarantee of acceptable or even meaningful results unless the input data submitted for processing is meaningful and acceptable to begin with." The Public Works Department is not now trying to develop accurate cost records through the computer. Nor does there exist appropriate quantitative, physical information relative to maintenance.

If, however, the appropriate input data were incorporated, the use of a computer, (or in other words, an information-processing device), could be seen as a powerful aid in "devising, checking, and monitoring any system of cost control."

Thus, "the computer is not an electronic brain, and it will not produce answers to questions. What can be expected is rapid and accurate processing of information submitted in strict, predetermined format. This processing takes place according to procedures developed by the user and expressed precisely in the form of statements of a computer program."[2]

Thus, simply incorporating a computerized system does not insure that an effective cost control system will be maintained, unless the appropriate input data is included within that system.

It should be realized that a computerized system is not absolutely necessary, but functions merely as an aid.

In developing recommendations for changes in accounting and reporting procedures, sections of Walker's Practical Accounting and Cost Keeping for Contractors; Frank R. Walker Company, Publishers; Ninth Edition revised and written by Susan E. Powers and Brisbane H. Brown; 1982; were found that provide a very clear, concise, and thorough depiction of a legitimate cost accounting system. The following includes direct excerpts from this publication.

In order for a cost accounting system to be viable and to allow for the effective implementation of the six functions of management, a uniform set of cost codes should be developed to distinguish the various phases of the construction project.

There are several reasons why the cost codes are of such importance. First, they serve to distinguish and identify the many different items of work that comprise a job in a consistent and uniform manner. Walker's goes on to recommend the use of the AIA 16 divisions for the specifications, (see Appendix IV-A), and the CSI 'MASTERFORMAT'

for use where buildings are the object of the accounting and cost analysis.

For road building work such as done by the Putnam County Public Works Department, we recommend use of the "Chart of Cost Accounts" found in the American Road Builders' Association, Cost Accounting Manual for Highway Contractors - A System for Cost Control, by Dan S. Brock. (See Appendix IV-B.)

The second function of the cost codes is that they facilitate the accumulation of information over the life of a job in a manner that allows the individual to compare his estimated costs to his actual costs. For any system to be effective, it is most important that the classification of accounts be applied uniformly and consistently. This will result in cost information that can be used from estimate to estimate and job to job since the breakdowns will always be by the same classifications.

The third major function of the cost codes is that of providing uniformity and consistency for reporting and analysis of the cost information once it is accumulated.

There are several steps that must be followed to insure that cost coding is used to its maximum effectiveness.

First a system of cost codes must be selected to reflect the information that the organization requires. This will be determined by the cost accounting system and the level of detail which the agency chooses. The small agency may only require broader categories, the larger agency may have hundreds of cost accounts to accurately accumulate the information it requires. The agency must select the codes that are to be used for each type of work on every specific job.

The second phase of cost coding involves communicating these cost

codes to all the persons involved in their actual use. For estimators, they may have a master listing of codes. For the foremen, a list for each specific job should be furnished to them with specific instructions relating to the particular job.

The agency must be very careful that it does not request too much detail since this can cause the foremen to refuse to use the codes since they will be confusing and will be too time consuming. This can also cost the agency far more to maintain its system than it should.

The third main item in effective use of cost codes is that of properly instructing the foremen in the correct use of the codes. The foreman will be coding two major pieces of information with the cost codes. They are 1) man hours of labor and 2) job costs.

The proper function of the entire cost accounting system is primarily dependent on how consistently and how accurately the foreman records and codes the information coming from his crew. This is probably the most important link in the information system.

Management must follow up on the coding and regularly check that the coding is being consistently applied. The failure to regularly check the foreman's coding is an omission that can seriously affect the quality of the information in the system. If it is not coded properly at the first level, no cost accounting system will give you the proper usable information.

Once the individual has recorded the different types of work accomplished and how many hours the workmen have worked, he must accumulate and then distribute this information to the individual job records. To accomplish this, labor distribution cards, ...(see Appendix IV-C1), are used which allow the many pieces of information from the

time cards to be summarized by cost codes so they can be transferred to the job records.

The purpose of the distribution cards is to accumulate the many different pieces of labor cost, production, and unit cost information from the time cards, into summary amounts by cost code. This information must be accumulated by cost code, since the entire estimating, building, and recording of a job is done on this basis.

To illustrate how this is actually done...Appendix IV-C2 shows a completed time card.

The information on the time card regarding the types of work and hours worked is transferred to the distribution cards... (Appendix IV-C3). This step of transferring the information from the time cards to the distribution cards is done as frequently as the time cards are brought in, preferably daily but sometimes done weekly. Many cards may be required for a large job where work is being completed in many cost categories. When it is done daily, the same card is used for the entire week. Then at the end of the week each of the distribution cards is totaled. Once each card has been totaled, the dollar amounts on all of the cards are all added together and this grand total is compared to the total payroll for the week. They should be the same if everything has been transferred correctly to the sheets. The accumulated weekly card totals (man-hours, dollars, and units of production) are then posted (written on the card) to the job cost ledgers for each category of work.

The regular upkeep of these job cost ledgers lets the agency know at any point in time its total labor, materials and costs for each job item. By comparing the total costs of each of the separate cost codes

with the total amount of work completed on that section the unit costs can be calculated.

For the busy agency regular cost reports are probably one of the most important managerial tools that it has at its disposal. They can alert the agency, while the job is in progress, of problem areas that need immediate attention as well as inform the management of the overall performance of the agency.

Unfortunately, it is often time-consuming to prepare the reports. The secret lies in assembling only the needed information in a practical, concise report that is simple to read.

Labor is the cost that an agency has the most direct control over. Not only does it control who works, but also how many, and how long they work. For this very reason, the agency must know the details of its labor costs on a frequent basis.

Weekly, a labor cost report should be prepared...(Appendix IV-C4). As shown in the figure, the report is prepared for each job and is arranged by cost codes that have direct labor expenses. The information for this report is taken from the job cost ledgers after the weekly payroll information has been posted to them from the distribution cards.

The real value of this report is that the agency can see at a glance for the entire job how its unit costs and dollar costs for the week stand in relation to its original estimates for each category. With this kind of information, it is relatively easy to pinpoint problem areas where unit costs or total costs have varied from the estimates by significant amounts. The agency can then take action to correct the problem before it gets out of hand.

Where the weekly labor report only covers labor costs, the monthly job cost report...(Appendix IV-C5) covers all job costs. The report is prepared by job and is basically a detailed summary of the job cost ledgers with a further estimate of the projected costs to complete the work under each job cost code.

This report allows the agency to appraise the cost situation on each job by cost code.

The monthly job cost analysis report...(Appendix IV-C6) brings the job cost information from all of the jobs for the year (in progress) as well as the billing information into a single report which allows the agency to see just where it stands overall.

2. Equipment Accounting System

A second recommendation which we propose is that an equipment accounting system be used, not only for long term equipment replacement planning, but also for productivity analysis and maintenance scheduling. (See sample report forms in Appendix IV-D from Cost Accounting Manual for Highway Contractors - A System for Cost Control.)

3. Require, Institute, and Standardize Cost Coding Accounting and Reporting Procedures

We propose that Construction Associations in Florida promote the development and passage of legislation which would require, institute, and standardize cost coding accounting and reporting procedures for public agencies contemplating force account work.

A first step may be to promote legislation similar in nature to California Bill #AB1666, which sets up a Commission to study the issue.

4. In-Depth Study

The final proposal is that an in-depth study be made of force account productivity in a public agency which has a sophisticated

cost accounting and control system in effect. It would then be possible to make cost and productivity comparisons between the public and private sectors.

Endnotes

1. Managing - A Contemporary Introduction; Joseph L. Massie and John Douglas; Prentice-Hall, Inc.; 1981.
2. Creative Control of Building Costs; Sponsored by the American Institute of Architects; Edited by William Dudley Hunt, Jr., 1967.

APPENDIX IV-A

APPENDIX IV-A

Walker's Practical Accounting and Costkeeping for Contractors - 9th edition

Currently, the most widely used system of cost codes is one that is jointly produced by the Construction Specifications Institute (CSI) and the Construction Specifications Canada (CSC). This master list of "MASTERFORMAT" as it is called organizes the different construction cost areas into an easily understandable, uniform list of broad categories and then further into more narrow specific cost items.

This list was originally prepared as a consistent method of organizing material for project manuals. Since its original publication, it has been widely accepted in the industry as the standard for this type of listing. As mentioned previously, the AIA organizes the bid packages and specifications by this system. This is one of the major reasons contractors are encouraged to use this system, since it is so widely used throughout the industry.

The "MASTERFORMAT", at its most basic level is arranged in 16 technical divisions and a division 0 which provides a method of standard reference and filing numbers for bidding and contract forms. They are as follows:

Division 0
Bidding and Contract Requirements

Division 1
General Requirements

Division 2
Sitework

Division 3
Concrete

Division 4
Masonry

Division 5
Metals

Division 6
Wood and Plastics

Division 7
Thermal and Moisture Protection

Division 8
Doors and Windows

Division 9
Finishes

Division 10
Specialties

Division 11
Equipment

Division 12
Furnishings

Division 13
Special Construction

Division 14
Conveying Systems

Division 15
Mechanical

Division 16
Electrical

These basic 17 divisions are then further broken down into a Broadscope listing, which lists the major subcategories within the division. The listing is then divided even further into a narrow scope listing which covers virtually every possible type of construction work.

Naturally, smaller jobs will not require the extensive detail in the cost accounts that larger jobs will. So, the MASTERFORMAT is arranged so that the level of detail can be suited to the job. When more detail is required, contractors can expand on the basic categories with more specific accounts relative to a particular job. This is generally done as soon as the job is awarded as the preliminary scheduling is being done.

At the most detailed level, the MASTERFORMAT allows the contractor a great deal of flexibility. For

example in Division 3 - Concrete, sections 03200 (Concrete Reinforcement), 03250 (Concrete Accessories) and 03300 (Cast-in-Place Concrete) the following detail is shown:

03200	**CONCRETE REINFORCEMENT**
-10	Reinforcing Steel
-20	Welded Wire Fabric
-30	Stressing Tendons
-40	Fibrous Reinforcing
03250	**CONCRETE ACCESSORIES**
-51	Expansion and Contraction Joints
-52	Anchors and Inserts
-53	Waterstops
03260-03299	(Reserved)
03300	**CAST-IN-PLACE CONCRETE**
-01	Concrete Admixtures
-10	Structural Concrete
-11	Normalweight Structural Concrete
-12	Heavyweight Structural Concrete
-13	Lightweight Structural Concrete
-14	Prestressed Structural Concrete
-15	Shrinkage Compensating Concrete
-20	Concrete Topping
-30	Architectural Concrete
-31	Normalweight Architectural Concrete
-32	Lightweight Architectural Concrete
-34	Prestressed Architectural Concrete
-40	Low Density Concrete
-41	Insulating Concrete
-45	Concrete Finishing
	Finishing Vertical Surfaces
	Finishing Horizontal Surfaces

The above listed code numbers are all five digits. The first two indicate the division number. The third digit is the subcategory within the division, and the fourth and fifth digits indicate the specific type of work within the subcategory.

The number 03220 would be broken down as follows:

03.....Division 03 - Concrete
2.....Subcategory 2 - Concrete Reinforcement
20.....Type of Work - Welded Wire Fabric

For example, the above number - 03220 would be used when purchasing, using or reporting all costs incurred involving welded wire fabric for concrete reinforcement.

For the smaller contractor, this amount of detail may not be required. He would then use the Broadscope listings that applied to his job.

The MASTERFORMAT Broadscope Section Titles are as follows:

A PRACTICAL SYSTEM OF WORK CLASSIFICATION

DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS

00010 PRE-BID INFORMATION
00100 INSTRUCTIONS TO BIDDERS
00200 INFORMATION AVAILABLE TO BIDDERS
00300 BID/TENDER FORMS
00400 SUPPLEMENTS TO BID/TENDER FORMS
00500 AGREEMENT FORMS
00600 BONDS AND CERTIFICATES
00700 GENERAL CONDITIONS OF THE CONTRACT
00800 SUPPLEMENTARY CONDITIONS
00950 DRAWINGS INDEX
00900 ADDENDA AND MODIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

01010 SUMMARY OF WORK
01020 ALLOWANCES
01030 SPECIAL PROJECT PROCEDURES
01040 COORDINATION
01050 FIELD ENGINEERING
01060 REGULATORY REQUIREMENTS
01070 ABBREVIATIONS AND SYMBOLS
01080 IDENTIFICATION SYSTEMS
01100 ALTERNATES/ALTERNATIVES
01150 MEASUREMENT AND PAYMENT
01200 PROJECT MEETINGS
01300 SUBMITTALS
01400 QUALITY CONTROL
01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
01600 MATERIAL AND EQUIPMENT
01650 STARTING OF SYSTEMS
01660 TESTING, ADJUSTING, AND BALANCING OF SYSTEMS
01700 CONTRACT CLOSEOUT

DIVISION 2 - SITEWORK

02010 SUBSURFACE INVESTIGATION
02050 DEMOLITION
02100 SITE PREPARATION
02150 UNDERPINNING
02200 EARTHWORK
02300 TUNNELLING
02350 PILES, CAISSONS AND COFFERDAMS
02400 DRAINAGE
02440 SITE IMPROVEMENTS
02480 LANDSCAPING
02500 PAVING AND SURFACING
02590 PONDS AND RESERVOIRS
02600 PIPED UTILITY MATERIALS AND METHODS
02700 PIPED UTILITIES
02800 POWER AND COMMUNICATION UTILITIES
02850 RAILROAD WORK
02880 MARINE WORK

DIVISION 3 - CONCRETE

03050	CONCRETING PROCEDURES
03100	CONCRETE FORMWORK
03150	FORMS
03180	FORM TIES AND ACCESSORIES
03200	CONCRETE REINFORCEMENT
03250	CONCRETE ACCESSORIES
03300	CAST-IN-PLACE CONCRETE
03350	SPECIAL CONCRETE FINISHES
03360	SPECIALLY PLACED CONCRETE
03370	CONCRETE CURING
03400	PRECAST CONCRETE
03500	CEMENTITIOUS DECKS
03600	GROUT
03700	CONCRETE RESTORATION AND CLEANING

DIVISION 4 - MASONRY

04050	MASONRY PROCEDURES
04100	MORTAR
04150	MASONRY ACCESSORIES
04200	UNIT MASONRY
04400	STONE
04500	MASONRY RESTORATION AND CLEANING
04550	REFRACTORIES
04600	CORROSION RESISTANT MASONRY

DIVISION 5 - METALS

05010	METAL MATERIALS AND METHODS
05050	METAL FASTENING
05100	STRUCTURAL METAL FRAMING
05200	METAL JOISTS
05300	METAL DECKING
05400	COLD-FORMED METAL FRAMING
05500	METAL FABRICATIONS
05700	ORNAMENTAL METAL
05800	EXPANSION CONTROL
05900	METAL FINISHES

DIVISION 6 - WOOD AND PLASTICS

06050	FASTENERS AND SUPPORTS
06100	ROUGH CARPENTRY
06130	HEAVY TIMBER CONSTRUCTION
06150	WOOD-METAL SYSTEMS
06170	PREFABRICATED STRUCTURAL WOOD
06200	FINISH CARPENTRY
06300	WOOD TREATMENT
06400	ARCHITECTURAL WOODWORK
06500	PREFABRICATED STRUCTURAL PLASTICS
06600	PLASTIC FABRICATIONS

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07100	WATERPROOFING
07150	DAMPPROOFING

07200 INSULATION
07250 FIREPROOFING
07300 SHINGLES AND ROOFING TILES
07400 PREFORMED ROOFING AND SIDING
07500 MEMBRANE ROOFING
07570 TRAFFIC TOPPING
07600 FLASHING AND SHEET METAL
07800 ROOF ACCESSORIES
07900 JOINT SEALANTS

DIVISION 8 - DOORS AND WINDOWS

08100 METAL DOORS AND FRAMES
08200 WOOD AND PLASTIC DOORS
08250 DOOR OPENING ASSEMBLIES
08300 SPECIAL DOORS
08400 ENTRANCES AND STOREFRONTS
08500 METAL WINDOWS
08600 WOOD AND PLASTIC WINDOWS
08650 SPECIAL WINDOWS
08700 HARDWARE
08800 GLAZING
08900 GLAZED CURTAIN WALLS

DIVISION 9 - FINISHES

09100 METAL SUPPORT SYSTEMS
09200 LATH AND PLASTER
09230 AGGREGATE COATINGS
09250 GYPSUM WALLBOARD
09300 TILE
09400 TERRAZZO
09500 ACOUSTICAL TREATMENT
09550 WOOD FLOORING
09600 STONE AND BRICK FLOORING
09650 RESILIENT FLOORING
09680 CARPETING
09700 SPECIAL FLOORING
09760 FLOOR TREATMENT
09800 SPECIAL COATINGS
09900 PAINTING
09950 WALL COVERING

DIVISION 10 - SPECIALITIES

10100 CHALKBOARDS AND TACKBOARDS
10150 COMPARTMENTS AND CUBICLES
10200 LOUVERS AND VENTS
10240 GRILLES AND SCREENS
10250 SERVICE WALL SYSTEMS
10260 WALL AND CORNER GUARDS
10270 ACCESS FLOORING
10280 SPECIALTY MODULES
10290 PEST CONTROL
10300 FIREPLACES AND STOVES
10340 PREFABRICATED STEEPLES, SPIRES, AND CUPOLAS
10350 FLAGPOLES

10400 IDENTIFYING DEVICES
10450 PEDESTRIAN CONTROL DEVICES
10500 LOCKERS
10520 FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES
10530 PROTECTIVE COVERS
10550 POSTAL SPECIALTIES
10600 PARTITIONS
10650 SCALES
10670 STORAGE SHELVING
10700 EXTERIOR SUN CONTROL DEVICES
10750 TELEPHONE ENCLOSURES
10800 TOILET AND BATH ACCESSORIES
10900 WARDROBE SPECIALTIES

DIVISION 11 - EQUIPMENT

11010 MAINTENANCE EQUIPMENT
11020 SECURITY AND VAULT EQUIPMENT
11030 CHECKROOM EQUIPMENT
11040 ECCLESIASTICAL EQUIPMENT
11050 LIBRARY EQUIPMENT
11060 THEATER AND STAGE EQUIPMENT
11070 MUSICAL EQUIPMENT
11080 REGISTRATION EQUIPMENT
11100 MERCANTILE EQUIPMENT
11110 COMMERCIAL LAUNDRY AND DRY CLEANING EQUIPMENT
11120 VENDING EQUIPMENT
11130 AUDIO-VISUAL EQUIPMENT
11140 SERVICE STATION EQUIPMENT
11150 PARKING EQUIPMENT
11160 LOADING DOCK EQUIPMENT
11170 WASTE HANDLING EQUIPMENT
11190 DETENTION EQUIPMENT
11200 WATER SUPPLY AND TREATMENT EQUIPMENT
11300 FLUID WASTE DISPOSAL AND TREATMENT EQUIPMENT
11400 FOOD SERVICE EQUIPMENT
11450 RESIDENTIAL EQUIPMENT
11460 UNIT KITCHENS
11470 DARKROOM EQUIPMENT
11480 ATHLETIC, RECREATIONAL, AND THERAPEUTIC EQUIPMENT
11500 INDUSTRIAL AND PROCESS EQUIPMENT
11600 LABORATORY EQUIPMENT
11650 PLANETARIUM AND OBSERVATORY EQUIPMENT
11700 MEDICAL EQUIPMENT
11780 MORTUARY EQUIPMENT
11800 TELECOMMUNICATION EQUIPMENT
11850 NAVIGATION EQUIPMENT

DIVISION 12 - FURNISHINGS

12100 ARTWORK
12300 MANUFACTURED CABINETS AND CASEWORK
12500 WINDOW TREATMENT
12550 FABRICS
12600 FURNITURE AND ACCESSORIES
12670 RUGS AND MATS

12700 MULTIPLE SEATING
12800 INTERIOR PLANTS AND PLANTINGS

DIVISION 13 - SPECIAL CONSTRUCTION

13010 AIR SUPPORTED STRUCTURES
13020 INTEGRATED ASSEMBLIES
13030 AUDIOMETRIC ROOMS
13040 CLEAN ROOMS
13050 HYPERBARIC ROOMS
13060 INSULATED ROOMS
13070 INTEGRATED CEILINGS
13080 SOUND, VIBRATION, AND SEISMIC CONTROL
13090 RADIATION PROTECTION
13100 NUCLEAR REACTORS
13110 OBSERVATORIES
13120 PRE-ENGINEERED STRUCTURES
13130 SPECIAL PURPOSE ROOMS AND BUILDINGS
13140 VAULTS
13150 POOLS
13160 ICE RINKS
13170 KENNELS AND ANIMAL SHELTERS
13200 SEISMOGRAPHIC INSTRUMENTATION
13210 STRESS RECORDING INSTRUMENTATION
13220 SOLAR AND WIND INSTRUMENTATION
13410 LIQUID AND GAS STORAGE TANKS
13510 RESTORATION OF UNDERGROUND PIPELINES
13520 FILTER UNDERDRAINS AND MEDIA
13530 DIGESTION TANK COVERS AND APPURTENANCES
13540 OXYGENATION SYSTEMS
13550 THERMAL SLUDGE CONDITIONING SYSTEMS
13560 SITE CONSTRUCTED INCINERATORS
13600 UTILITY CONTROL SYSTEMS
13700 INDUSTRIAL AND PROCESS CONTROL SYSTEMS
13800 OIL AND GAS REFINING INSTALLATIONS AND CONTROL SYSTEMS
13900 TRANSPORTATION INSTRUMENTATION
13940 BUILDING AUTOMATION SYSTEMS
13970 FIRE SUPPRESSION AND SUPERVISORY SYSTEMS
13980 SOLAR ENERGY SYSTEMS
13990 WIND ENERGY SYSTEMS

DIVISION 14 - CONVEYING SYSTEMS

14100 DUMBWAITERS
14200 ELEVATORS
14300 HOISTS AND CRANES
14400 LIFTS
14500 MATERIAL HANDLING SYSTEMS
14600 TURNTABLES
14700 MOVING STAIRS AND WALKS
14800 POWERED SCAFFOLDING
14900 TRANSPORTATION SYSTEMS

DIVISION 15 - MECHANICAL

15050 BASIC MATERIALS AND METHODS
15200 NOISE, VIBRATION, AND SEISMIC CONTROL

15250 INSULATION
15300 SPECIAL PIPING SYSTEMS
15400 PLUMBING SYSTEMS
15450 PLUMBING FIXTURES AND TRIM
15500 FIRE PROTECTION
15600 POWER OR HEAT GENERATION
15650 REFRIGERATION
15700 LIQUID HEAT TRANSFER
15800 AIR DISTRIBUTION
15900 CONTROLS AND INSTRUMENTATION

DIVISION 16 - ELECTRICAL

16050 BASIC MATERIALS AND METHODS
16200 POWER GENERATION
16300 POWER TRANSMISSION
16400 SERVICE AND DISTRIBUTION
16500 LIGHTING
16600 SPECIAL SYSTEMS
16700 COMMUNICATIONS
16850 HEATING AND COOLING
16900 CONTROLS AND INSTRUMENTATION

The complete listing of the MASTERFORMAT is available through the CSI, 1150 17th St., N.W., Washington, D.C. 20036. Ph. (202) 833-2160.

We appreciate being granted permission by the Construction Specifications Institute to reprint the Broadscope Section Titles and the example of the narrow scope listing.

APPENDIX IV-B

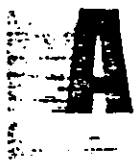


CHART OF COST ACCOUNTS
BASIC CHART
INDIRECT COSTS

COST SECTION A
GENERAL, ADMINISTRATIVE & JOB OVERHEAD
(to be used for Parent Company, Divisions, Subsidiaries & Jobs)

1 Total Costs

2 Total Costs Excluding Taxes On Income

3 Indirect Costs - Total

4 Indirect Costs Excluding Taxes On Income - Total

5 Labor - Total

6 Salaries & Wages - Total

7 Idle Time - Total

8 Premium Time - Total

9 Benefits - Total

10 Recruiting & Hiring - Total

11 Employee Identification - Total

12 Payroll Taxes Applied - Total

13 Bonds & Insurance - Total

14 Bonds - Total

15 Insurance - Total

16 Insurance Based On Payroll/Gross Receipts - Total

17 Insurance - Other - Total

18 Taxes - Total

19 Taxes Based On Payroll - Total

20 Taxes - Other - Total

21 Taxes On Income - Total

22 Travel Expense - Total

23 Sales Commissions - Total

24 Bonuses - Total

25 Professional Services - Total

26 Bidding Expense - Total

27 Business Promotion - Total

28 Industry Expense/Associations - Total

29 Contributions - Total

30 Office & Office Expense - Total

31 Office Building & Space - Total

32 Office Expense - Total

33 Communications - Total

34 Data Processing - Total

35 Safety, First Aid & Medical - Total

36 Financing - Total

37 Warehouse & Storage Yard - Total

38 Real Estate & Land Development - Total

39 Explorations & Options - Total

40 Cost Credits For Payroll Taxes, Insurance & Overhead - Total

41 Small Tools & Expendable Supplies - Total

42 Winter Reserve - Total

43 Loans To Officers & Employees - Total

44 Life Insurance On Executives - Total

45 Directors' Fees - Total

46 Stock Registration & Transfer Fees - Total

47 Provision For Bad Debts - Total

48 Jobs Closed Out In Prior Years - Total

49 Miscellaneous Expense - Unallocated - Total

50 Inventory Adjustments - Total

51 Gain Or Loss On Sale Of Assets - Total

(Continued)

A

CHART OF COST ACCOUNTS

BASIC CHART

INDIRECT COSTS

COST SECTION A

GENERAL, ADMINISTRATIVE & JOB OVERHEAD (Continued)
(to be used for Parent Company, Divisions, Subsidiaries & Jobs)

52 - 53	Open
54	General Job Overhead - Total
55	Job Plant Set Up - Total
56	Other Job Overhead - Total
57	Camp Expense & Revenue - Total
58	Expense - Total
59	Revenue - Total
60 - 62	Open
63	Equipment Expense & Revenue - Total
64	Expense - Total
65	Revenue - Total
66	Automotive Equipment Expense & Revenue - Total
67	Expense - Total
68	Revenue - Total
69	Construction Equipment & Plant Expense & Revenue - Total*
70	Expense - Total
71	Revenue - Total
72	Marine Equipment Expense & Revenue - Total
73	Expense - Total
74	Revenue - Total
75	Aviation Equipment Expense & Revenue Total
76	Expense - Total
77	Revenue - Total
78 - 79	Open
80	Back-Charges Expense & Revenue - Total
81	Expense - Total
82	Revenue - Total
83 - 84	Open
85	Clearing Accounts - Total
86	Overhead Charges To Divisions, Subsidiaries, Profit Centers & Jobs By Parent Company, Divisions & Subsidiaries - Total
87 - 89	Open
90	Labor Control Account - Total
91 - 99	Open

*If it is desired to separate "Construction Equipment" and "Plant," a new series of account numbers may be assigned for "Plant."

CHART OF COST ACCOUNTS
BASIC CHART

COST SECTION B

OPEN FOR FUTURE ASSIGNMENT

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION C
MOBILIZATION, SITE PREPARATION & GRADING

— MOBILIZATION & SITE PREPARATION —

1 Direct Cost - Total

2 Mobilization, Site Preparation & Grading - Total

3 Mobilization - Total (use when a bid item)

4 Site Preparation - Total

5 Clearing & Grubbing - Total

6 Existing Facilities/Features - Remove/Modify - Total

7 - 21 (Assigned As Subdivisions Under Account 6 in the Expanded Chart)

22 - 24 Open

— GRADING —

25 Grading - Total

26 Excavation - Total

27 Strip Topsoil - Total

28 Strip & Stockpile Topsoil - Total

29 Strip Unsuitable Material - Total

30 Load, Haul & Spread Topsoil From Stockpile - Total

31 Excavation - Unclassified - Total

32 Excavation - Earth - Total

33 - 35 Open

36 Excavation - Rock - Total

37 Excavation - Rock - Total (Drill, Blast, Load, Haul & Place)

38 Excavation - Rock - Total (Rip, Load, Haul & Place)

39 Excavation - Boulders - Total

40 Excavation - Borrow - Total

41 - 42 Open

43 Excavation - Unsuitable Material/Peat/Muck - Total

44 Excavation - Dredging - Total

45 Open

46 Excavation - Shells - Total

47 Excavation - Pervious Material - Sand/Gravel - Total

48 Open

49 Excavation - Channel - Earth - Dry - Total

50 Excavation - Channel - Earth - Wet - Total

51 Excavation - Channel - Rock - Dry - Total

52 Excavation - Channel - Rock - Wet - Total (Drill, Blast, Load, Haul & Place)

53 Excavation - Shoulder/Ditch - Total

54 Overhaul - Total

55 Embankment - Total

56 Embankment - Earth - Compacted - Total

57 Embankment - Earth - Uncompacted - Total

58 Embankment - Rock - Compacted - Total

59 Embankment - Rock - Uncompacted - Total

60 Embankment - Earth & Rock Mixed/Unclassified - Compacted - Total

61 Embankment - Earth & Rock Mixed/Unclassified - Uncompacted - Total

(Continued)

C

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION C
MOBILIZATION, SITE PREPARATION & GRADING (Continued)

62	Embankment - Pervious Material - Compacted - Total
63	Embankment - Pervious Material - Uncompacted - Total
64	Embankment - Muck Blanket - Total
65	Settlement Platforms - Total
66	Compaction Tests - Total
67	Dust/Pollution Control - Total
68	Trim Roadway, Shoulders & Slopes - Total
69	Build/Maintain Haul Roads - Total
70	Rock Protection - Total
71	Rip Rap - Total
72 - 99	Open

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION D
DRAINAGE

1 Drainage - Total
2 Excavation - Total
3 Open
4 Excavation - Trench - Total
5 Excavation - Drainage Structures - Total
6 Backfill - Trench, Drainage Structures - Total
7 Excavation - Ditches - Inlet/Outlet - Total
8 Sheeting & Shoring - Total
9 Dewatering - Total
10 - 11 Open
12 Pipe - Total
13 Pipe - Plain Cement Concrete - Total
14 Pipe - Reinforced Cement Concrete - Mortar Joints - Total
15 Pipe - Reinforced Cement Concrete - Rubber Gasket Joints - Total
16 Pipe - Elliptical Reinforced Cement Concrete - Total
17 Pipe - Corrugated Metal - Total
18 Pipe - Corrugated Metal - Bituminous Paved Invert - Total
19 Pipe - Corrugated Metal - Bituminous Coated - Total
20 Pipe - Corrugated Metal - Asbestos Bonded - Total
21 Pipe - Corrugated Metal - Nestable - Total
22 Pipe - Corrugated Metal - Arch - Total
23 Pipe - Corrugated Metal - Nestable Arch - Total
24 Pipe - Corrugated Metal - Plate Arch - Total
25 Pipe - Vitrified Clay - Single Strength - Mortar Joints - Total
26 Pipe - Vitrified Clay - Double Strength - Mortar Joints - Total
27 Pipe - Vitrified Clay - Single Strength - Rubber Gasket Joints - Total
28 Pipe - Vitrified Clay - Double Strength - Rubber Gasket Joints - Total
29 Pipe - Asbestos Cement - Total
30 Pipe - Bituminized Fiber - Total
31 Pipe - Cast Iron - Total
32 Pipe - Ductile Iron - Total
33 Pipe - Steel - Total
34 Half-Pipe - Reinforced Cement Concrete - Total
35 Half-Pipe - Vitrified Clay - Total
36 Half-Pipe - Corrugated Metal - Total
37 Half-Pipe - Corrugated Metal - Bituminous Coated - Total
38 - 42 Open
43 Miscellaneous Drainage Items - Total
44 Existing Pipe Work - Total
45 Boring - Total
46 Pipe Jacking - Total
47 - 49 Open
50 Drainage Structures - Total
51 Inlets Complete - Total
52 Catch Basins Complete - Total
53 Manholes Complete - Total
54 Miscellaneous Drainage Structures - Total
55 Open

(Continued)

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION D
DRAINAGE (Continued)

56	Underdrain - Total
57	Pipe Underdrain - Complete - Total
58	Pipe Outlets - Complete - Total
59	French Drains/Subgrade Drains - Complete - Total
60	Pipe For Underdrain - Perforated Pipe - Concrete - Total
61	Pipe For Underdrain - Perforated Pipe - Clay - Total
62	Pipe For Underdrain - Perforated Corrugated Metal - Total
63	Pipe For Underdrain - Perforated Corrugated Metal - Bituminous Paved Invert - Total
64	Pipe For Underdrain - Perforated Corrugated Metal - Bituminous Coated - Total
65	Pipe For Underdrain - Perforated Bituminized Fiber - Total
66	Pipe For Underdrain - Perforated Asbestos Cement - Total
67	Pipe For Underdrain - Clay Farm Drain - Total
68	Pipe For Underdrain - Concrete Farm Drain - Total
69	Aggregate Backfill - Total
70	Timber/Lumber Total
71	Masonry - Total
72	Masonry - Stone - Total
73	Masonry - Brick - Total
74	Masonry - Block - Total
75	Concrete For Drainage - Total
76	Concrete For Inlets/Catch Basins/ Manholes - Total
77	Concrete For Headwalls - Total
78	Concrete For Miscellaneous Structures - Total
79	Open
80	Concrete Forms For Drainage Structures - Total
81	Reinforcing Steel For Drainage Structures - Total
82	Castings - Total
83	Steel Frames & Grates - Total
84	Miscellaneous Metal - Total
85	Drainage Gates - Total
86	Drainage Pumping Station - Total
87 - 99	Open

E

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION E
UTILITIES

1 Utilities - Total
2 Utilities Excavation - Total
3 Excavation - Utility Trench - Total
4 Excavation - Utility Structures - Total
5 Backfill - Trench/Structures - Total
6 Sheeting & Shoring - Total
7 Dewatering - Total
8 - 9 Open
10 Water System Complete - Total
11 Water Pipe - Total
12 Fittings - Total
13 Valves/Meters/Fountains - Total
14 Hydrants - Total
15 Tests/Sterilization - Total
16 Water Manholes Complete - Total
17 Pumping Station Complete - Total
18 Wells - Total
19 Water Tower/Tank - Total
20 Sprinkling/Irrigation System Complete - Total
21 Miscellaneous Water Operations - Total
22 Concrete - Total
23 - 24 Open
25 Gas Line System Complete - Total
26 Gas Lines - Total
27 Gas Pipe/Accessories - Total
28 Gas Manholes Complete - Total
29 Miscellaneous Gas Operations - Total
30 Concrete - Total
31 - 32 Open
33 Sewer System Complete - Total
34 Sewers - Total
35 Sewer Pipe - Total
36 Sewer Pipe - Concrete - Total
37 Sewer Pipe - Vitrified Clay - Total
38 Sewer Pipe - Metal - Total
39 Pipe Inspection & Tests - Total
40 Sewer Manholes Complete - Total
41 Sewage Pumping Station Complete - Total
42 Sewage Disposal Facilities - Total
43 Sewage Treatment Plant - Total
44 House Connections - Total
45 Miscellaneous Sewer Operations - Total
46 Miscellaneous Structures - Total
47 Concrete - Total
48 - 49 Open
50 Electrical Facilities - Total
51 Wiring - Total
52 Conduit/Duct - Total
53 Transformers - Total
54 Lights - Total
55 Signals - Total
56 Signs - Total (Electrical/Control Facilities)

(Continued)

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION E
UTILITIES (Continued)

57 Electrical Manholes Complete - Total

58 Miscellaneous Electrical Structures - Total

59 Miscellaneous Electrical Facilities - Total

60 Miscellaneous Electrical Accessories - Total

61 Miscellaneous Electrical Operations - Total

62 Concrete - Total

63 - 64 Open

65 Communications - Total

66 Telephone/Telegraph - Total

67 Wiring - Total

68 Conduit/Duct - Total

69 Manholes Complete - Total

70 Miscellaneous Telephone/Telegraph Structures - Total

71 Miscellaneous Telephone/Telegraph Facilities - Total

72 Miscellaneous Telephone/Telegraph Accessories - Total

73 Miscellaneous Telephone/Telegraph Operations - Total

74 Concrete - Total

75 - 76 Open

77 Radio Facilities - Total

78 - 79 Open

80 Railroads - Total
Excavation - (Use accounts in Section C)

81 Track - Total

82 Track Specials - Total

83 Railroad Electrical Facilities - Total

84 Miscellaneous Railroad Operations - Total

85 Concrete - Total
Railroad Telephone/Telegraph
(Use Communications Accounts)

86 - 99 Open

F

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION F
STRUCTURES

1 Structures - Total
2 Excavation - Total
3 Excavation - Unclassified - Total
4 - 7 (Assigned as subdivisions under Account 3 in the Expanded Chart)
8 Open
9 Excavation - Earth - Total
10 - 13 (Assigned as subdivisions under Account 9 in the Expanded Chart)
14 - 16 Open
17 Excavation - Rock - Total
18 - 19 (Assigned as subdivisions under Account 17 in the Expanded Chart)
20 - 22 Open
23 Sheeting & Shoring - Total
24 Fine Grade Footings - Total
25 Granular Backfill Under Footings - Total
26 Membrane Seal Under Footings - Total
27 Backfill - Total
28 Dikes - Total
29 Excavation - Channel Diversion - Total
30 Excavation - Temporary Roads & Working Platforms - Total
31 Dewatering - Total
32 Test Borings/Drilling & Grouting - Total
33 - 34 Open
35 Piles - Total
36 Piles - Steel H - Total
37 Piles - Timber - Untreated - Total
38 Piles - Timber - Treated - Total
39 Piles - Cast-In-Place Concrete - Steel Shell - Total
40 Piles - Cast-in-Drilled Hole Concrete - Total
41 Piles - Cast-in-Place Concrete - Steel Pipe - Open End - Total
42 Piles - Cast-in-Place Concrete - Steel Pipe - Closed End - Total
43 Piles - Pre-cast Concrete - Total
44 Piles - Pre-Cast Pre-Stressed Concrete - Total
45 Piles - Pre-Cast Concrete Sheet - Total
46 Piles - Steel Sheet - Total
47 Piles - Composite - Total
48 Drill Shaft - Total
49 Open
50 Pile Load Test - Total
51 Casting Yard for Piles/Beams/Girders - Total
52 Open
53 Marine & Cofferdams - Total
54 (Assigned as subdivision under Account 53 in the Expanded Chart)
55 Caissons - Air - Total
56 Caissons - Open & Drilled - Total
57 Open
58 Concrete Complete - Total
59 Concrete Complete Including Reinforcing Steel - Total
60 Concrete - Total
61 Concrete - Ready Mix/Purchased - Total

(Continued)

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION F
STRUCTURES (Continued)

62 Concrete - Job Produced - Total

63 Clearing Account For Job Produced Concrete - Total

64 Concrete - Place Complete - Total

65 Concrete Operations/Accessories - Total

66 Open

67 Concrete Forms - Total

68 Clearing Account For Form Materials - Total

69 Reinforcing Steel - Total

70 Clearing Account For Reinforcing Steel - Total

71 Erect Pre-Cast Or Pre-Cast Pre-Stressed Units - Total

72 Masonry - Total

73 Open

74 Heavy Iron & Steel - Total

75 Structural Steel - Total

76 Miscellaneous Steel - Total

77 Re-Erect Steel & Steel Structures - Total

78 Miscellaneous Metals - Total

79 Temporary Facilities - Total

80 Repairs/Modifications To Existing Structures - Total

81 Remove Existing Structures - Total

82 Electrical Facilities For Structures - Total

83 Bridge Operating Machinery - Total

84 Crib Type Retaining Wall - Total

85 Miscellaneous - Total

86 - 99 Open

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION G
PAVEMENTS

1 Pavements - Total
2 Subgrade - Total
3 Subbase For Pavement - Total
4 Subbase Aggregates - Total
5 Subbase Binders - Total
6 Bituminous Applications - Total
7 Subbase For Shoulders - Total
8 Subbase Aggregates - Total
9 Subbase Binders - Total
10 Bituminous Applications - Total
11 Existing Subbase Modifications - Total
12 Open
13 Clearing Account For Subbase Mixing Plant Operation - Total
14 Base Course For Pavement - Total
15 Base Course Aggregates - Total
16 Base Course Binders - Total
17 Bituminous Applications - Total
18 Base Course For Shoulders - Total
19 Base Course Aggregates - Total
20 Base Course Binders - Total
21 Bituminous Applications - Total
22 Pavement Of Types Listed Above For Base Course - Total
(See Details in Expanded Chart - Accounts 14.00 - 14.99)
23 Pavement Aggregates - Total
(See Details In Expanded Chart - Accounts 15.00 - 15.99)
24 Pavement Binders - Total
(See Details In Expanded Chart - Accounts 16.00 - 16.99)
25 Bituminous Applications - Total
(See Details In Expanded Chart - Accounts 17.00 - 17.99)
26 Existing Base Course Modifications - Total
27 - 28 Open
29 Clearing Account For Base Course Mixing Plant Operation - Total
30 Bituminous Pavement - Total
31 Hot Plant Mix - Total
32 Cold Plant Mix - Total
33 Asphalt Emulsion Mix - Total
34 Sheet Asphalt - Total
35 Sand Asphalt - Total
36 Bitumens & Bituminous Applications - Total
37 Existing Bituminous Pavement Modifications - Total
38 - 40 Open
41 Clearing Account For Asphalt Plant - Total
42 Concrete Pavement - Total
43 Standard Plain P.C. Concrete Pavement - Total
44 Standard Reinforced P.C. Concrete Pavement - Total
45 Standard Continuous Reinforced P.C. Concrete Pavement - Total
46 Slip-Form Plain P.C. Concrete Pavement - Total
47 Slip-Form Reinforced P.C. Concrete Pavement - Total
48 Slip-Form Continuous Reinforced P.C. Concrete Pavement - Total

(Continued)

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION G
PAVEMENTS (Continued)

49 - 51	Open
52	Concrete Base - Total
53	Standard Plain P.C. Concrete Base - Total
54	Standard Reinforced P.C. Concrete Base - Total
55	Slip-Form Plain P.C. Concrete Base - Total
56	Slip-Form Reinforced P.C. Concrete Base - Total
57	Traffic Control For Roadway/Shoulder/ Widening Base & Pavement Built Under Traffic - Total
58	Open
59	Miscellaneous Items - Total
60	Miscellaneous Concrete - Total
61	Concrete Curb - Total
62	Concrete Curb & Gutter - Total
63	Concrete Gutter - Total
64	Concrete Median Divider - Total
65	Concrete Spillway/Trench Paving - Total
66	Concrete Patching - Total
67	Sidewalk/Miscellaneous - Total
68	Miscellaneous Curb - Total
69	Open
70	Clearing Account For Dry Batch Concrete Plant For Pavement - Total
71	Clearing Account For Central Mix Concrete Plant For Pavement - Total
72	Protective Coating For Concrete Pavement - Total
73	Miscellaneous Pavement - Total
74 - 99	Open

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION H
TRAFFIC CONTROL

1	Traffic Control - Total
2	Maintenance & Protection Of Traffic - Total (Use when a bid item)
	— TEMPORARY FACILITIES —
3	Temporary Facilities/Detours - Total
4	Excavation - Total
5	Embankment - Total
6	Drainage - Total
7	Base Course - Total
8	Pavement - Total
9	Dust/Pollution Control - Total
10	Barricades - Total
11	Signs - Total
12	Lighting - Total
13	Signals - Total
14	Markers - Total
15	Channelization/Curbing - Total
16	Guard Rail - Total
17	Fence - Total
18	Flagmen - Total
19	Remove/Reconstruct/Modify Existing Facilities - Total
20 - 24	Open
	— PERMANENT FACILITIES —
25	Permanent Facilities - Total
26	Guard Rail - Total
27	Cable Guard Rail - Total
28	Metal Beam Guard Rail - Total
29	Open
30	Timber Guard Rail - Total
31	Rock Boulder Barrier - Total
32	Other Guard Rail/Accessories - Total
33	Guard Posts - Total
34	Barricades Left In Place - Total
35 - 37	Open
38	Median Barrier - Total
39	Fencing - Total
40	Woven Wire - Total
41	Chain Link - Total
42	Barbed Wire - Total
43	Other Types - Total
44	Open
45	Signs - Total
46	Metal Signs - Total
47	Wood Signs - Total
48	Illuminated Signs - Total
49	Changeable Message Signs - Total
50	Flashing Beacon Signs - Total
51	Other Signs - Total
52 - 54	Open
55	Lighting - Total
56 - 57	Open
58	Signals - Total

(Continued)

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION H
TRAFFIC CONTROL (Continued)

59	Flashing Warning Signals - Total
60	Traffic Control Signals - Total
61	Railroad Crossing Signals - Total
62	School/Pedestrian Crossing Signals - Total
63	Road Condition Signals - Total
64	Other Signals - Total
65	Open
66	Markers - Total
67 - 69	Open
70	Truck Inspection/Weigh Station - Total
71	Toll Collection Facility - Total
72	Miscellaneous Items - Total
73 - 99	Open

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
EXPANDED CHART

COST SECTION I
OPEN FOR FUTURE ASSIGNMENT

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION J
LANDSCAPING & ROADSIDE DEVELOPMENT

1 Landscaping & Roadside Development - Total

— LANDSCAPING —

2 Landscaping - Total

3 Site Preparation - Total

4 Site Grading - Total

5 Topsoil - Total

6 Preparing Planting Area - Total

7 Seeding/Sodding/Sprigging Complete - Total

8 Seeding Complete - Total

9 Sodding Complete - Total

10 Sprigging Complete - Total

11 Soil Treatment - Total

12 Lime - Total

13 Fertilizer - Total

14 Grass Seed - Total

15 Sod - Total

16 Sprigs - Total

17 Mulch - Total

18 Hydro Seeding/Nozzle Planting - Total

19 Overseeding & Fertilizing - Total

20 Ground Cover - Total

21 Erosion Control/Slope & Ditch Protection - Total

22 Maintenance - Total

23 Salvaging & Replacing Sod - Total

24 Edging - Total

25 - 26 Open

27 Planting Trees/Shrubs/Vines - Total

28 Planting Trees - Total

29 Planting Shrubs - Total

30 Planting Vines - Total

31 Direct Seeding - Tree Seeds - Total

32 Transplant/Remove & Reset Plants - Total

33 - 34 Open

35 Marker Signs - Total

36 Miscellaneous Items - Total

37 - 39 Open

— ROADSIDE DEVELOPMENT —

40 Roadside Development - Total

41 Buildings - Total

42 Engineers' Field Office - Total

43 Engineers' Field Laboratory - Total

44 Engineers' Field Office & Laboratory - Total

45 Other Buildings - Total

46 - 47 Open

48 Rest Areas - Total

49 Site Preparation - Total

50 Picnic/Rest Facilities - Total

51 Refuse Facilities - Total
(See Expanded Chart for Details)

52 Miscellaneous Facilities/Operations - Total

53 Travel Trailer Facilities - Total

54 Car Bumpers - Total

(Continued)

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION J
LANDSCAPING & ROADSIDE DEVELOPMENT (Continued)

55	Walkways - Total
56	Utilities - Total
57	Electrical Facilities Complete - Total
58	Water Systems Complete - Total
59	Plumbing - Total
60	Heating - Total
61	Air Conditioning - Total
62	Sanitary Facilities - Total (See Expanded Chart for Details)
63	Communications - Facilities - Total
64	Fire Protection Systems - Total
65	Equipment Servicing Facilities - Total
66	Compressed Gas/Air Systems - Total
67	Fuel Storage & Dispensing Systems - Total
68	Miscellaneous Items - Total
69 - 99	Open

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION K
SPECIAL ITEMS

Accounts 1 to 99 may be used for special contract items and special items of work which are not readily classified under previous direct cost sections.

1	Special Items - Total
2 - 99	Open

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
EXPANDED CHART

COST SECTIONS L - M - N - O
OPEN FOR FUTURE ASSIGNMENT

CHART OF COST ACCOUNTS
JOB DIRECT COSTS
BASIC CHART

COST SECTION P
EXTRA WORK/CONTRACT CHANGES/CLAIMS

1 - 99 Open

Use this section to record cost for Extra Work and Contract Changes to provide Owner with a segregated and detailed tabulation of costs for authorized Extra Work and Contract Changes when prior agreement on price has not been reached, and for work claimed by Contractor to be outside the scope of the contract, pending resolution of payment status (whether contract or extra work) by Contractor and Owner. It may also be used for authorized Force Account Work.

This section may also be used for similar situations relating to sub-contractors, material suppliers, equipment dealers and manufacturers and other agencies.

Direct Costs recorded should include in addition to the job direct costs for work items, such costs as cancellation charges, extra vendor charges, special equipment costs, special engineering costs and any directly related costs that would normally be recorded as indirect costs.

The Indirect Costs may be used to support the actual percentage relationship of job indirect costs and company indirect costs to the direct costs when an inadequate allowance is provided in the contract or offered in negotiations. If such Extra Work goes to formal claim procedures for settlement, these records will be invaluable supporting evidence for your claim.

This section should be used as a clearing account. After agreement on payment, the costs should be transferred to the appropriate sections and work items, leaving a zero balance in this section.

CHART OF COST ACCOUNTS
BASIC CHART

COST SECTION Q
EQUIPMENT COSTS

1 Equipment Costs - Total
(Use sub-account numbers 1.01 to 1.99 (as in Expanded Chart) for additional cost summaries and sub-totals as desired.)

2 Open

3 - 99 Assign one account number to each type of equipment used, with a sub-account number for each equipment unit. For an unusually large equipment fleet the sub-sub-account numbers may also be used.

Recommended groupings:

1. Automotive Equipment
   - Personnel Vehicles
   - Trucks
   - Trailers
2. Construction Equipment
   - Detail as necessary by types
3. Fixed Plant
   - Detail as necessary by types
4. Marine Equipment
   - Detail as necessary by types
5. Aviation Equipment
   - Detail as necessary

Costs charged against each unit of equipment or plant to include direct costs, equipment division indirect costs, and division/subsidiary/corporate indirect costs as appropriate, using sub-account numbers 1.01 to 1.99 as required.

Each equipment unit should be identified by a number that identifies the type as well as unit. For example, Bulldozers may be assigned type number 12, with each unit numbered from one chronologically as purchased, allowing sufficient numbers for each type for a ten year period before reusing numbers previously assigned.

A supplementary designation should be used for rented/leased equipment which should be included for costing.

R

CHART OF COST ACCOUNTS
BASIC CHART
PROFIT CENTERS

COST SECTION R
QUARRIES & SAND/GRAVEL PITS/PLANTS

1 Profit Centers - Total
2 Expense - Total
3 Revenue - Total
4 Quarries Profit Center - Total
5 Expense - Total
6 Revenue - Total
7 Quarry No. 1 Profit Center - Total
8 Expense - Total
9 Quarry Operation - Total
10 Crushing Plant Operation - Total
11 Stockpile Material - Total
12 Load Crushed Aggregate - Total
13 Deliver Crushed Aggregate - Total
14 Revenue - Total
15 - 22 Quarry No. 2 Profit Center - Total
(Use same accounts as above)
23 - 30 Quarry No. 3 Profit Center - Total
(Use same accounts as above)
31 - 39 Open
40 Sand/Gravel Pits/Plants Profit Center - Total
41 Expense - Total
42 Revenue - Total
43 Sand/Gravel Pit/Plant No. 1 Profit Center - Total
44 Expense - Total
45 Pit Operation - Total
46 Washing/Crushing/Screening Plant Operation - Total
47 Stockpile Material - Total
48 Load Sand & Gravel - Total
49 Deliver Sand & Gravel - Total
50 Revenue - Total
51 - 58 Sand/Gravel Pit/Plant No. 2 Profit Center - Total
(Use same accounts as above)
59 - 66 Sand/Gravel Pit/Plant No. 3 Profit Center - Total
(Use same accounts as above)
67 - 99 Open

CHART OF COST ACCOUNTS

BASIC CHART

PROFIT CENTERS

COST SECTION S

ASPHALT, CONCRETE & PRE-CAST/PRE-STRESSED CONCRETE PLANTS

1 Profit Centers - Total

2 Expense - Total

3 Revenue - Total

4 Asphalt Plants Profit Center - Total

5 Expense - Total

6 Revenue - Total

7 Asphalt Plant No. 1 Profit Center - Total

8 Expense - Total

9 Materials - Total

10 Plant Operation - Total

11 Deliver Mix - Total

12 Revenue - Total

13 - 18 Asphalt Plant No. 2 Profit Center - Total
(Use same accounts as above)

19 - 24 Asphalt Plant No. 3 Profit Center - Total
(Use same accounts as above)

25 - 26 Open

27 Concrete Plants Profit Center - Total

28 Expense - Total

29 Revenue - Total

30 Concrete Plant No. 1 Profit Center - Total

31 Expense - Total

32 Materials - Total

33 Batch Plant Operation - Total

34 Batch Haul - Total

35 Central Mixing Plant Operation - Total

36 Deliver Concrete - Total

37 Revenue - Total

38 - 45 Concrete Plant No. 2 Profit Center - Total
(Use same accounts as above)

46 - 53 Concrete Plant No. 3 Profit Center - Total
(Use same accounts as above)

54 - 55 Open

56 Pre-Cast/Pre-Stressed Concrete Plants Profit Center - Total

57 Expense - Total

58 Revenue - Total

59 Pre-Cast/Pre-Stressed Concrete Plant No. 1 Profit Center - Total

60 Expense - Total

61 Concrete Complete - Total

62 Furnish Concrete - Total

63 Forms - Total

64 Reinforcing Steel - Total

65 Pre-Stressing Steel - Total

66 Place Concrete - Total

67 Cure Concrete - Total

68 Handle/Store Product - Total

69 Deliver Product - Total

70 Revenue - Total

71 - 82 Pre-Cast/Pre-Stressed Concrete Plant No. 2 Profit Center - Total
(Use same accounts as above)

83 - 94 Pre-Cast/Pre-Stressed Concrete Plant No. 3 Profit Center - Total
(Use same accounts as above)

95 - 99 Open

CHART OF COST ACCOUNTS
BASIC CHART
PROFIT CENTERS

COST SECTION T
EQUIPMENT

1	Profit Centers - Total
2	Expense - Total
3	Revenue - Total
4	Equipment Profit Centers - Total
5	Expense - Total
6	Revenue - Total
7	Automotive Equipment Profit Center - Total
8	Expense - Total
9	Revenue - Total
10	Construction Equipment & Plant Profit Center - Total*
11	Expense - Total
12	Revenue - Total
13	Marine Equipment Profit Center - Total
14	Expense - Total
15	Revenue - Total
16	Aviation Equipment Profit Center - Total
17	Expense - Total
18	Revenue - Total
19 - 99	Open

*If it is desired to separate "Construction Equipment" and "Plant," a new series of account numbers may be assigned for "Plant."

APPENDIX IV-C

APPENDIX IV-C1

WEEKLY DISTRIBUTION SUMMARY

JOB: JONES WAREHOUSE — WEEK OF: 4/12-- — COST CODE: 08110 — NAME: STANDARD STEEL DOORS

	MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY			SUNDAY		
	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT
	32	15	336	30	14	320	34	16	365	2	1	23	2	1	23						
	FOREMAN NO 200			FOREMAN NO 200			FOREMAN NO 200			FOREMAN NO 200			FOREMAN NO 200			FOREMAN NO			FOREMAN NO		
	10	4	126	36	17	377	12	6	151												
	FOREMAN NO 439			FOREMAN NO 439			FOREMAN NO 439			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
	FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
	FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
	FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
	FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
TOTAL	42	19	462	66	31	697	46	22	516	2	1	23	2	1	23						

CARD TOTAL HOURS 158	CARD TOTAL UNITS 74	CARD TOTAL AMOUNT 1721
UNIT COST $\frac{\text{TOTAL \$ AMOUNT}}{\text{TOTAL UNITS}}$ \$ 23.26 PER UNIT	HOURS PER UNIT $\frac{\text{TOTAL HOURS}}{\text{TOTAL UNITS}}$ 2.14 HRS PER UNIT	

Fig. 52. Weekly Distribution Summary

DAILY TIME SHEET

FOREMAN: Sam Edwards
JOB: Jones Warehouse
DATE: 6/12/--
WEATHER: Clear, 86°

NOTE: FIELD PERSONNEL COMPLETE UNSHADED AREAS ONLY

NAME	EMP. NO.	RATE	CODE	DESCRIPTION: FORMS-CAST IN PLACE STAIRS 03110 HRS	03110 $	FORMS-RETAINING WALL 03114 HRS	03114 $	FORMS-SIDEWALKS 03116 HRS	03116 $	HRS	$	HRS	$	HRS	$	HRS	$	TOTALS HRS	TOTALS $	TOTAL HOURS	REMARKS
MARK WILSON	134	14.60	R	8	116.80													8	116.80	8	
			O	1	21.90													1	21.90	1	
JOE LITTLE	142	14.50	R			8	116.00											8	116.00	8	
			O																		
AMOS CLARK	143	11.85	R			8	94.80											8	94.80	8	
			O																		
BOB GAY	188	11.00	R	8	88.00													8	88.00	8	
			O	1	16.50													1	16.50	1	
JON PETERSON	181	11.30	R					8	90.40									8	90.40	8	
			O																		
TOTALS				18	243.20	16	210.80	8	90.40									42	544.40	42	
				AMT.		AMT.		AMT.		AMT.		AMT.		AMT.		AMT.					
PRODUCTION THIS DAY				25 SF		200 SF		250 LF													

Fig. 53. Completed Time Card.

APPENDIX IV - C3

PRACTICAL ACCOUNTING

WEEKLY DISTRIBUTION SUMMARY

JOB: JONES WAREHOUSE — WEEK OF: 6/12/-- — COST CODE: 03110 — NAME: STRUCTURAL CAST IN PLACE CONCRETE FORMWORK

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY			SUNDAY		
WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT	WORK HOURS	PROD UNITS	$ AMT
18	25	243^{20}																		
FOREMAN NO 103			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
16	21	210^{00}																		
FOREMAN NO 144			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO			FOREMAN NO		
TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
34	46	453^{20}																		
CARD TOTAL HOURS						CARD TOTAL UNITS						CARD TOTAL AMOUNT								

W — UNIT COST = $\frac{\text{TOTAL \$ AMOUNT}}{\text{TOTAL UNITS}}$ = $ ____ PER UNIT — HOURS PER UNIT = $\frac{\text{TOTAL HOURS}}{\text{TOTAL UNITS}}$ = ____ HRS. PER UNIT

Fig. 54. Weekly Distribution Summary.

APPENDIX IV - C4

PRACTICAL COST AND STATUS REPORTS

WEEKLY LABOR COST REPORT

JOB: JONES WAREHOUSE DATE: 4/12 - 4/18/19--

COST CODE	DESCRIPTION	QUANTITY OF PRODUCTION (A) TOTAL ESTIMATED QUANTITY	(B) THIS WEEK	(C) TO DATE	% COMP (D)	LABOR UNIT COST (E) ESTIMATE	(F) THIS WEEK	(G) TO DATE	TOTAL LABOR COST (H) ESTIMATE	(I) (C x G) TO DATE	(J) (C x E) SHOULD BE	(K) (A x G) PROJECTED COST	(L) (H - K) PROJECTED (OVER) UNDER
03152	FRAME & ERECT FORMS FOR CONC. BEAMS	FBM 2000	1193	1193	60	.595	.607	.607	1190.16	724.30	710.00	1213.95	(23.79)
03154	FRAME & ERECT FORMS FOR RETAINING WALL	354	104	104	29	1.09	1.12	1.12	385.84	116.48	113.36	396.48	(10.64)
03152	BUILD & ERECT & REMOVE COLUMN FORMS	459	312	460	100	2.12	2.09	2.09	973.08	961.40	973.08	961.40	11.68

Fig. 72. Weekly Labor Cost Report

APPENDIX IV - C5

PRACTICAL ACCOUNTING

MONTHLY JOB COST REPORT

JOB: JONES WAREHOUSE DATE: 3/31/-- PAGE 1 OF 6

COST CODE	DESCRIPTION	QUANTITY ESTIMATE (A)	QUANTITY TO DATE (B)	% COMP (C)	COSTS ESTIMATE (D)	COSTS TO DATE (E)	ESTIMATED UNIT COST (F)	TO DATE UNIT COST (G)	PROJECTIONS QUANTITY TO COMPLETE (H) = (A - B)	PROJECTED TOTAL COST (I) = (G x A)	PROJECTED (OVER) UNDER (J) = (D - I)
DIV. 01	GENERAL CONDITIONS	—	—		850.00	700.00	—	—	—	900.00	(50.00)
—	TAXES PERMITS, INSURANCE	—	—		4200.00	3100.00	—	—	—	4100.00	100.00
—	SUPERINTENDENT	—	—		7200.00	4800.00	—	—	—	6500.00	700.00
01500	TEMPORARY STRUCT. SMALL TOOLS & EQUIP.	—	—		1720.00	1600.00	—	—	—	1750.00	(50.00)
02110	SITE CLEARING	—	—	100	935.00	935.00	—	—	—	935.00	—
02220	EXCAVATION/BACKFILL	400 CY	425 CY	100	610.00	650.00	1.53	1.53	0	650.00	—
02460	GRADING - ROUGH & FINISH	7500 SF	7500 SF	100	250.00	250.00	.03	.03	0	250.00	—
03311	FOUNDATION	10 CY	10 CY	100	548.00	542.00	54.80	54.20	0	542.00	6.00
07100	WATER & DAMPPROOF	L.S.	L.S.	100	200.00	200.00	—	—	—	200.00	—
03310	CEMENT FLOORS WALKS, PAVEMENT	125 CY	93 CY	74	6875.00	5075.00	55.00	54.56	32 CY	6820.00	55.00
03311	REINFORCED CONCRETE BEAMS, JOISTS, STAIRS	28 CY	10 CY	36	1820.00	670.00	65.00	67.00	18 CY	1876.00	(56.00)
04220	BRICK AND CONCRETE MASONRY	600 SF	500 SF	83	1572.00	1310.00	2.62	2.62	100 SF	1572.00	—
06110	ROUGH CARPENTRY FRAMING, ETC.	2900 BF	400 BF	17	1680.00	280.00	.70	.70	2000 BF	1680.00	—

Fig. 73. Monthly Job Cost Report

PRACTICAL COST AND STATUS REPORTS

MONTHLY JOB COST ANALYSIS -- PAGE 1

JOB NUMBER	NAME	TOTAL EST. COST (A)	% COMP. (B)	% COSTS COMPLETED (C) (A ÷ B)	ACTUAL COSTS (D) (E + F + G + H)	LABOR (E)	MATERIAL (F)	SUB-CONTRACT (G)	GENERAL (H)	PROJECTED COST TO COMPLETE (I)	CURRENT (OVER) UNDER (J) (A - I)
8214	JONES WAREHOUSE	263,520	90	237,168	237,940	80,393	53,529	95,176	8,942	274,313	(10,793)
8217	CITY HALL ADDN.	295,434	60	177,260	176,850	90,200	39,230	86,600	10,820	294,750	684
8218	WILLIAMS RES.	78,041	100	78,041	79,186	30,091	20,060	26,475	2,560	79,186	(1,145)
8220	WISE DRUG STORE	30,161	40	12,064	12,343	983	900	8500	1,860	30,608	(447)
8229	UNIVERSITY COMPUTER CENTER	102,767	30	30,830	30,800	9288	6956	12120	2436	102,667	100
8225	FAT BOY STEAK HOUSE	84,893	15	12,734	13,100	1744	3210	4900	3246	87,333	(2440)
8226	PATRICK QUADRAPLEX	154,845	45	69,680	70,025	28147	19520	18,158	4200	155,611	(766)
8227	EVANS GARAGE ADDITION	5848	95	5556	6,421	3463	1390	-0-	568	5706	142
8228	BUSCH APARTMENT BUILDING	215,202	70	150,641	149,890	52650	43036	46,721	8483	219,129	1,073
8230	SEGAL BUILDING CONVERSION	145,604	5	7280	8,700	—	—	4544	4156	145,604	—
8231	HISTORIC SOCIETY RENOVATION	93,406	5	4,670	5,300	1,000	1275	-0-	3025	97250	(3844)
8232	BLUE JAY DRESS SHOP INTERIOR	19,052	15	2,858	2936	—	—	1949	987	19573	(521)
8233	DR. ELTON CLINIC	86,915	25	21,729	21,700	5025	4046	8479	4150	86800	115
8244	ELTON RES.	115,488	10	11,549	12,470	1898	3612	4850	2110	124,700	(9212)

MONTHLY JOB COST ANALYSIS -- PAGE 2

CURRENT CONTRACT AMOUNT (K)	CHANGE ORDERS APPROVED (L)	CHANGE ORDERS PENDING (M)	AMOUNT BILLED (N)	RETAINAGE (O)	AMOUNT REMAINING UNBILLED (P) (K - N)	PROJECTED PROFIT/ (LOSS) (Q) (K - I)
286,435	1,246	—	257,792	25779	28643	12,122
314,291	7,850	790	188,575	18857	125716	19,541
86,712	326	750	86,712	8671	-0-	7,526
32,784	—	286	13,114	1,311	19670	2,176
112,314	—	4,750	33,694	3369	112,314	9,647
94,326	2786	—	14,149	1415	80,177	6993
166,500	—	—	74,925	7493	91,575	10,889
6,800	—	—	6,460	646	340	1,094
231,400	9,430	—	161,980	16,198	69,420	17,271
158,265	4,320	—	7913	791	150,352	12661
102,644	—	7,210	5,132	513	97,512	5394
21,650	437	786	3248	325	18402	2077
94,473	—	—	23618	2362	70,855	7,673
128,320	3123	275	12832	1283	115,488	3620

Fig. 74. Monthly Job Cost Analysis Report

APPENDIX IV-D

DAILY TIME DISTRIBUTION
EQUIPMENT

Report No. _____

Foreman's Daily Report

Station

Cost Code

Company

Job Name _____ No. _____

Foreman _____

Date _____ 19 _____

Day* M T W T F S S
1 2 3 4 5 6 7

Describe Work Done

Report work done, repairs needed, repairs made, equipment transfers and receipts, diary etc. on reverse side

Equipment No.	Description	Use Rate	Productive Hours								Total		Idle Hours			Total Hours Available	Down for Repairs	Total Shift Hrs.
			Hrs.	Amt.	Hrs.	Amt.	Hrs.	Amt.	Hrs.	Amt.	Hrs.	Amt.	Weather	No Work	Other			
		Totals																

*Circle appropriate letter

Approved by _____

Form No. 4 Foreman's Daily Equipment Distribution Report

Company

DAILY TIME DISTRIBUTION — LABOR & EQUIPMENT

Report No. _____

Job No. _____ Name _____

Foreman _____

Date _____ 19 _____

Day* M T W T F S S
1 2 3 4 5 6 7

					Equipt Delays Hours			
Station								
Cost Code								
Describe Work Done					Repairs	Weather	No Work	Other

Employee or Equipt No.	Name	Total Hrs.	Occup	Rate	Hrs.	Occup	Rate	Hrs.	Occup	Rate	Hrs.	Occup	Rate	Hrs.
Equipt														

*Circle Appropriate Letter

If "occupation" columns not reqvired after first group, use space for additional cost distribution.

Report work done, repairs needed, repairs made, equipment transfers and receipts, diary etc. on reverse side.
For Equipment, report only total hours for each operation.

Approved by _____

Form No. 5 Foreman's Daily Time Distribution for Labor & Equipment

EQUIPMENT COST REPORT BY UNITS

Page _____

_____ Company

Period Ending _____ 19____

Equip. No.	Description	Model	Year Acquired U-Used	COST	COSTS				HOURS		Average Hourly Cost	Hourly Use Rate
					Ownership	Fixed	Operating & Repairs	Total	Available	Used		
				1	= Cost for period							
				2	= Cost to date							

Form No. 17 – Equipment Cost Report by Units

EQUIPMENT AVAILABILITY & UTILIZATION REPORT

_____
Company

Page _____ of _____

Job _____ Division _____ Period Ending _____ 19 _____

	Type Equipment	No. Units	Gross Hours Available	Regular Hours Charged	Overtime Hours Charged	Total Hours Charged	% Hours Charged	Net Hours Available	% Net Hours Available	Hours In Shop	% Hours In Shop	Hours Field Downtime	% Field Downtime
Previous Total	D-8 Dozer												
This Period													
Total To Date													
Previous Total	D-8 Dozer												
This Period													
Total To Date													
Previous Total	Totals												
This Period	D-8 Dozer												
Total To Date													

Report can list individual units or groups of like units.
Summarize individual unit listings by types and sizes of units such as D-8 Dozers, 30 T. Truck Cranes, Pickup Trucks, etc.
Report may be prepared for total company fleet and for each division, subsidiary and job.
Totals for previous year can be tabulated at beginning of each group for comparison, if desired.

Form No. 18 Equipment Availability & Utilization Report

V. CONCLUSION

This study set out to develop a methodology for investigating a public agency's accounting records with the object of finding productivity data which could be used in comparisons with similar data found in the private sector. The methodology is found in Section II of the report. The study found inadequacies in the subject agency's accounting system which precluded development of meaningful productivity data.

Having analyzed the inadequacies; the study went on to make recommendations for correcting the specific deficiencies found and for setting legal minimum accounting system requirements for public agencies.

The results found, and recommendations made, by this study should be particularly helpful to public agencies which find themselves in positions of developing accounting and control procedures to deal with construction.

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